FALCON

Currency Validator

Model FL-4

Model G3V

Falcon ™

SERVICE MANUAL

Pub. No.: G3M6148

Revision A – 14 September 2007

global payment technologies, inc.

IMPORTANT NOTICE

Global Payment Technologies, Inc. (the Company), reserves the right to make changes to the contents of this publication, including functions and specifications identified herein, without notice.

In the absence of a written agreement to the contrary, the Company, assumes no liability for the applications assistance, customer's product/application/concepts, or infringements of patents or copyrights of third parties arising from the use of products methods and architectures described herein. Nor does the Company, warrant or represent that any license, either expressed or implied, is granted under any patent right, copyright, or other combination of technology, architecture, or software as might be or is already in use.

Note: The material in this document is only intended for use by the Company, its employees and any licensed or authorized user of its proprietary products and/or software.

The techniques, procedures and information described herein are Confidential Information and should not be reproduced, disseminated, or otherwise disclosed without prior written consent from an officer of the Company. Any authorized licensee or user specifically acknowledges that such techniques, procedures and information comprise valuable trade secrets and proprietary property of the Company and that all patent, copyright, trade secrets, trade/service mark, and any other right, title or interest therein are the sole property of the Company.

This document has been copyrighted by the Company. The presence of any copyright notice within or upon the medium containing the Company's proprietary products shall not be construed as constituting any publication, any intention to publish or otherwise impairing the confidential nature thereof.

LIST OF EFFECTIVE PAGES

Dates of issue for the original manual and subsequent revision(s) and/or change(s) thereto are listed as follows:

Original issue	.....	15 January 2007
Revision A	.....	14 September 2007

© 2007 Global Payment Technologies, Inc.

Note: A copy of this document is available at *GPT's* Web site:
http://www.gpt.com

TABLE OF CONTENTS

PREFACE ..... **IX**
SCOPE X
PURPOSE X
INTENDED AUDIENCE X
ORGANIZATION OF THIS MANUAL X
CONVENTIONS USED IN THIS MANUAL X
WARNINGS, CAUTIONS, AND NOTES XI
CHANGES TO DOCUMENT XI
REFERENCE MATERIALS XII
GLOSSARY XII

CHAPTER 1 – OVERVIEW **1**
1.1 INTRODUCTION 2
1.2 SPECIFICATIONS 4
1.3 FEATURES 5
1.3.1 Sensor Suite 5
1.3.1.1 Optics 5
1.3.1.2 Front and Rear Optical Sensors 6
1.3.1.3 Optical Anti-Stringing Detection 6
1.3.2 Single-Head Configuration 6
1.3.3 Interface Connector(s) 6
1.4 IDENTIFYING YOUR CURRENCY VALIDATOR 7
1.5 STACKERS 11

CHAPTER 2 – DESCRIPTION OF EQUIPMENT **13**
2.1 CURRENCY VALIDATOR MAJOR ASSEMBLIES 14
2.1.1 Upper-Guide Assembly 14
2.1.2 Lower-Guide Assembly 15
2.2 STACKERS 17
2.2.1 Cash Box Assembly 17
2.2.2 Motor Module and Stacking Mechanism Assembly 17
2.3 PINOUT DESIGNATIONS 18
2.3.1 Input Power for 24-Volt Units 18
2.3.2 Input Power for 12-Volt Units 19

CHAPTER 3 – SOFTWARE/COMMUNICATION PROTOCOLS **21**
3.1 PROGRAM AND DATABASE ASSIGNMENTS 22
3.2 PROGRAM SPECIFICATION SHEETS 23
3.3 PROTOCOLS 27
3.3.1 Falcon Resident Protocols 27
3.3.1.1 Multi-Drop Bus 27
3.3.1.2 *GPT* RS-232 V2.2 Standard/Extended Protocol 27
3.3.1.3 ccTalk 28
3.3.2 Falcon Non-Resident Protocols 28
3.3.2.1 ID-003 28
3.3.2.2 *GPT* High-Level Pulse 28
3.3.2.3 *GPT* A2A Custom Parallel 29
3.3.2.4 VFM/GL5 (Serial/Pulse) 29
3.3.2.5 IGT 2.2 and 2.5 (Domestic and Foreign) 29

TABLE OF CONTENTS (CONTINUED)

CHAPTER 4 – THEORY OF OPERATION 31
4.1 FUNDAMENTAL OPERATION 32
4.2 CURRENCY VALIDATION PROCESSES 32
4.2.1 Power-Up Routine 32
4.2.2 Currency Validation Routine 34
4.2.2.1 Bill Acceptance Routine 34
4.2.2.2 Bill Rejection Routine 35
4.3 VALIDATOR STATES AND EVENTS 35
4.3.1 Validator States 35
4.3.1.1 Idle State 35
4.3.1.2 Accepting State 35
4.3.1.3 Stacking State 35
4.3.1.4 Escrow State (only occurs if Escrow Mode is enabled) 36
4.3.1.5 Returning State 36
4.3.1.6 Rejecting State 36
4.3.1.7 Inhibit State 36
4.3.2 Validator Events 37
4.3.2.1 Bill-Stacked Event 37
4.3.2.2 Bill-Returned Event 37
4.3.2.3 Cheated Event 37
4.3.2.4 Power-On Reset Event 37
4.3.2.5 Power Up with Credit Recovery Event 38
4.3.2.6 Communication Time-Out Event 38

CHAPTER 5 – DIAGNOSTICS 39
5.1 GENERAL INFORMATION 40
5.2 BEZEL LED CODES FOR MODEL G3V 40
5.3 RED STATUS LED 41
5.4 BEZEL DISPLAYS FOR MODELS FL-4 AND FL-6 42
5.4.1 Displays for Normal Equipment Operation 42
5.4.2 Self-Diagnostic Error Displays 43
5.5 TROUBLESHOOTING 44

CHAPTER 6 – PREVENTIVE MAINTENANCE 47
6.1 GENERAL INFORMATION 48
6.2 PERIODIC CLEANING 48
6.2.1 Cleaning Currency Channel 48
6.2.2 Required Items 48
6.2.3 Procedure 48
6.3 CALIBRATION AND BENCH TESTING 51
6.3.1 Video-Level Adjustment 51
6.3.1.1 Scope 51
6.3.1.2 Required Items 51
6.3.1.3 VLA Procedure 52
6.3.1.4 Description of VLA Process 53
6.3.2 Functional Test 53
6.3.2.1 Procedure 53
6.3.3 Service Acceptance Test 53
6.3.3.1 Required Items 54
6.3.3.2 Procedure 54

TABLE OF CONTENTS (CONTINUED)

6.4 SUPPLEMENTAL SERVICE PROCEDURES 56
6.4.1 Program Download Procedure 56
6.4.2 Memory Clear Procedure 56
6.4.3 Stacker Maintenance 56

CHAPTER 7 – CORRECTIVE MAINTENANCE 59
7.1 GENERAL INFORMATION 60
7.1.1 Major Assembly Cross-Reference Matrix 60
7.2 DEFLECTOR PLATE, BEZEL & SUPPORT BRACKET REMOVAL AND REPLACEMENT 62
7.2.1 Required Tools 62
7.2.2 Stacker/Deflector Plate Replacement Procedure for Model G3V Units 62
7.2.3 Bezel Assembly Replacement Procedure for Model G3V 64
7.2.4 Support Bracket Replacement Procedure for Model G3V 66
7.2.5 Bezel Assembly Replacement Procedure for Model FL-4 Units 70
7.2.6 Support Bracket Replacement Procedure for Model FL-4 Units 72
7.2.7 Bezel Assembly Replacement Procedure for Model FL-6 Units 76
7.2.8 Support Bracket Replacement Procedure for Model FL-6 Units 78
7.3 LOWER-GUIDE ASSEMBLY PARTS BREAKDOWN 82
7.3.1 Required Tools 82
7.3.2 Lower-Guide Housing Assembly – Disassembly Procedure 82
7.3.2.1 Replacement of Lower-Guide Optics Assembly 83
7.3.2.2 Replacement of Stepper Motor Assembly and Motor Bracket 88
7.3.2.3 Replacement of Front/Rear Pressure Rollers 90
7.3.2.4 Replacement of Idler Wheels, Shaft-Lock Housing, and Idler Spring 94
7.3.2.5 Replacement of Latch 98
7.3.3 Lower-Guide Optics Assembly Breakdown 99
7.3.3.1 Replacement of Main Assembly 99
7.3.3.2 Replacement of Regulator Assembly 104
7.3.3.3 Replacement of Bar Code Reader PCB Assembly 105
7.4 UPPER-GUIDE ASSEMBLY PARTS BREAKDOWN 106
7.4.1 Required Tools 106
7.4.2 Upper-Guide Housing Assembly – Disassembly Procedure 106
7.4.2.1 Replacement of Upper-Guide Optics Assembly 107
7.4.2.2 Replacement of Idler/Drive Gears, Axles, and Timing Belt 110
7.4.2.3 Replacement of Latch Spring 114
7.4.2.4 Replacement of Rear Sensor Prism and Side-Looking Sensor Optical Lenses 115
7.4.3 Upper-Guide Optics Assembly Breakdown 116
7.4.3.1 Replacement of Upper-Guide Array Assembly 117
7.4.3.2 Replacement of Lower-to-Upper-Guide Cable Assembly 120
7.4.3.3 Replacement of Stacker Cable Assembly 120
7.4.3.4 Replacement of Bezel Cable Assembly 121

INDEX 123

CONTACT INFORMATION 127

ADDENDUM – TECHNICAL BULLETINS 129
INTRODUCTION 130

Table of Contents

ILLUSTRATIONS

Figure 1-1. Falcon's Model G3V – Stacker Mounting Positions 2
Figure 1-2. Falcon's Front-Load Stacker Units 3
Figure 1-3. Sensor Suite – Cross-Sectional Views 5
Figure 1-4. Falcon's Main Cable Assembly for 24V Units (*GPT* PN 325EC003G) 6
Figure 1-5. Currency Validator's Identification Labels (Typical) 7
Figure 1-6. Part Number Label – Numbering Scheme for Model G3V 8
Figure 1-7. Part Number Label – Numbering Scheme for Models FL-4 and FL-6 9
Figure 1-8. CE/Warning Compliance Label (Typical) 10
Figure 1-9. Mounting Locations for CE/Warning Label 10
Figure 1-10. Falcon Stackers (Typical) 11
Figure 2-1. Falcon's Main Cable Assembly – Pin-Signal Assignments for 24-Volt Units 18
Figure 2-2. Falcon's Main Cable Assembly – Pin-Signal Assignments for 12-Volt Units 19
Figure 3-1. Sample Program Specification Sheet (3 Sheets) 24
Figure 4-1. Power-Up Routine Flow Chart for 24 VDC Units 33
Figure 5-1. Location of Red Status LED 41
Figure 6-1. Currency Channel - Cleaning Surfaces 50
Figure 6-2. 8-Pack DIP-Switches 52
Figure 6-3. SAT Setup Diagram 55
Figure 6-4. Stacker – Internal Parts 57
Figure 7-1. Falcon Model G3V with Stacker in Up-Right Position 62
Figure 7-2. Falcon Model G3V with Deflector Plate – Used on Down-Stack Units Only 63
Figure 7-3. Bezel Assembly & Support Bracket Hardware for Model G3V 64
Figure 7-4. Support Bracket Hardware for Model G3V 66
Figure 7-5. Separation of Support Bracket for Model G3V 67
Figure 7-6. Installation of Support Bracket for Model G3V 68
Figure 7-7. Installation of Spacer Gauge for Model G3V 68
Figure 7-8. Bezel Assembly & Support Bracket Hardware for Model FL-4 (2 Sheets) 70
Figure 7-9. Support Bracket Hardware for Model FL-4 72
Figure 7-10. Separation of Support Bracket for Model FL-4 73
Figure 7-11. Installation of Support Bracket for Model FL-4 74
Figure 7-12. Installation of Spacer Gauge for Model FL-4 74
Figure 7-13. Bezel Assembly & Support Bracket Hardware for Model FL-6 76
Figure 7-14. Support Bracket Hardware for Model FL-6 78
Figure 7-15. Separation of Support Bracket for Model FL-6 79
Figure 7-16. Installation of Support Bracket for Model FL-6 80
Figure 7-17. Installation of Spacer Gauge for Model FL-6 80
Figure 7-18. Lower-Guide Assembly Parts Breakdown (2 Sheets) 86
Figure 7-19. Stepper Motor Assembly Parts Breakdown 89
Figure 7-20. Front/Rear Pressure Rollers Parts Breakdown 91
Figure 7-21. Installation of Front Pressure Rollers 92
Figure 7-22. Installation of Rear Pressure Rollers 93
Figure 7-23. Idler Wheels, Shaft-Lock Housing, and Idler Spring Parts Breakdown 95
Figure 7-24. Installation of Idler Wheels, Shaft-Lock Housing & Idler Spring 96
Figure 7-25. Adjustment of Idler Spring 97
Figure 7-26. Latch Parts Breakdown 98

ILLUSTRATIONS (CONTINUED)

Figure 7-27. Lower-Guide Optics Assembly Parts Breakdown for PNs 325D0007-01 through 325D0007-06 102
Figure 7-28. Lower-Guide Optics Assembly Parts Breakdown for PNs 325D0007-07 through 325D0007-12 103
Figure 7-29. Regulator Assembly Parts Breakdown 104
Figure 7-30. Bar Code Reader Assembly Parts Breakdown 105
Figure 7-31. Upper-Guide Assembly Parts Breakdown 109
Figure 7-32. Upper-Guide Housing Assembly Parts Breakdown 111
Figure 7-33. Spring Latch Parts Breakdown 114
Figure 7-34. Inseparable Upper-Guide Assembly Parts Breakdown 115
Figure 7-35. Upper-Guide Optics Assembly Parts Breakdown 119

TABLES

Table 5-1. Bezel LED Codes for Model G3V 40
Table 5-2. Falcon Troubleshooting Chart 44
Table 5-3. Stacker Troubleshooting Chart 45
Table 6-1. DIP Switch Settings – Service Mode 52
Table 7-1. Falcon Currency Validator Part Breakdown Matrix 61
Table 7-2. Bezel Assembly & Support Bracket Hardware Parts List for Model G3V 65
Table 7-3. Bezel Assembly & Support Bracket Parts List for Model FL-4 71
Table 7-4. Bezel Assembly & Support Bracket Parts List for Model FL-6 77
Table 7-5. Lower-Guide Assembly Parts List 84
Table 7-6. Stepper Motor Assembly Parts List 88
Table 7-7. Front/Rear Pressure Rollers Assembly Parts List 90
Table 7-8. Idler Wheels, Shaft-Lock Housing & Idler Spring Parts List 94
Table 7-9. Latch Parts List 98
Table 7-10. Lower-Guide Optics Assembly Parts List 100
Table 7-11. Upper-Guide Assembly Parts List 107
Table 7-12. Upper-Guide Housing Assembly Parts List 110
Table 7-13. Latch Spring Parts List 114
Table 7-14. Inseparable Upper-Guide Assembly Parts List 115
Table 7-15. Upper-Guide Optics Assembly Parts List 118

Table of Contents

This page left intentionally blank.

PREFACE

This Preface Covers:

1. SCOPE
2. PURPOSE
3. INTENDED AUDIENCE
4. ORGANIZATION OF THIS MANUAL
5. CONVENTIONS USED IN THIS MANUAL
6. WARNINGS, CAUTIONS, AND NOTES
7. CHANGES TO DOCUMENT
8. REFERENCE MATERIALS
9. GLOSSARY

Scope

This Service Manual describes the features of the ***Falcon***™ Currency Validator family and their use. In addition, it contains a discussion of the Currency Validator's functions, configurations, components, protocols, theory of operation, diagnostics, preventive and corrective maintenance.

Purpose

This manual provides step-by-step instructions for servicing Falcon. Detailed shop information is provided to troubleshoot, repair, operate, and maintain the product properly. Also provided are detailed breakdown and re-assembly instructions. Adjunct information regarding available software and related communication protocols is provided in **Chapter 3**. To help service personnel identify replacement items, pictorials and descriptions of each part for Falcon and its companion stacker are provided in ***Falcon Parts Manual***, **Publication Number G3M6147**.

Intended Audience

The contents of this manual are intended for technical personnel responsible for the maintenance and repair of the Falcon Currency Validator. **This document is intended only for use by *GPT*-trained personnel and *GPT*-trained affiliates.** Authors of this manual assume that these personnel have a working knowledge of computers, electronic devices within vending and/or gaming machines, and their related software applications.

Organization of This Manual

This manual is organized into chapters that explain the features and functions of the Falcon Currency Validator. Each chapter has been divided into sections and subsections. Content outlines have been provided on the first page of each chapter.

Conventions Used in This Manual

This manual uses different fonts and symbols to differentiate between document elements and types of information. These conventions are summarized in the following Table:

Convention	Description
Normal Text	Normal or standard text font used throughout this document.
New or *unique term*	*GPT*-defined terminology found in the Glossary[1].
WARNING, CAUTION, or Note	Text used herein as adjunct statements.
Set DIP-Switch 9 to **on**. The escrow signal is sent.	Indicates a particular DIP-Switch setting or signal name designation between validator and host machine.
`File name or Directory`	Highlights the names of program directories, files, and extensions for file names. This convention is also used to show displays on text-based screens (e.g., to show the contents of a file).
Refer to **Chapter 3**	Internal document reference.
Falcon Installation Guide	Titles of reference materials (i.e., other documents).

[1] Only the first appearance of a unique term in a chapter is in italics; thereafter, throughout the chapter, it appears as normal text.

Warnings, Cautions, and Notes

Warnings, Cautions, and Notes throughout this manual are used as adjuncts to the text, and they are used as sparingly as possible consistent with the proper use of the Falcon Currency Validator. Warnings, Cautions, and Notes are defined below:

WARNINGS: A STATEMENT USED TO CALL ATTENTION TO POSSIBLE PERSONNEL INJURY OR LOSS OF HUMAN LIFE, PURSUANT TO A PROCEDURAL STEP, IF SAFETY PRECAUTIONS ARE NOT OBSERVED.

CAUTIONS: A statement used to call attention to possible indications and/or conditions, pursuant to a procedural step, that if not known, could cause the proper running of the Currency Validator to be disabled or unintentionally impaired.

Notes: A description of an unusual procedure or condition that must be brought to the user's attention. Notes are used to supply needed information that is not a step in procedure.

In addition, WARNINGS, CAUTIONS, and Notes are further identified by the following symbols:

Note: This symbol is located in the left margin and is placed adjacent to the actual WARNING.

Note: This symbol is located in the left margin and is placed adjacent to the actual CAUTION.

Note: This symbol is located in the left margin and is placed adjacent to the actual Note.

Changes to Document

Periodically, *GPT* technical publications must be updated to reflect the latest product information. *GPT* customers are encouraged to periodically check our Web site for updates and relevant technical bulletins at http://www.gpt.com/. Customers may also contact *GPT* Customer Service at customerservice@gptx.com or call 1 (800) 472-2506 for the latest information.

Reference Materials

Periodically, *GPT* will issue Technical Bulletins that may affect the contents of this manual and/or product. It is recommended that users of this manual refer to *GPT*'s Web site at: www.gpt.com

GPT Publications	Number	Description
Falcon Installation Guide	G3M6146	Provides procedures for installation, operation, and preventive maintenance for Falcon and its ancillary equipment(s). It introduces *GPT*'s product labeling and part numbering conventions. Fundamental operating requirements, simple troubleshooting, and basic field repair are also supplied.
Falcon Parts Manual	G3M6147	Provides the complete parts breakdown for all configurations of Falcon. It includes a cross-reference chart that defines the subassemblies for units that use 325GXXXXXXXX, 327GXXXXXXXX, or 328GXXXXXXXX part numbers.
V2.2 Standard Protocol Manual	G9S2091	Provides transmission format, states and events, modes of communication and operation, message timing, error handling, and command descriptions for V2.2 Standard Protocol developed by *GPT*.
V2e Host Controller Application User Guide	G9S6120	Describes the use and features of *GPT's* V2e Host Controller Application software. Includes procedures to upgrade the unit's currency database and application program, change memory setup options, view real-time data, and obtain self-diagnostic test results.

Glossary

The following acronyms and terms, which appear in this manual, are listed below for quick reference.

ADC: Analog–to-Digital Converter

Falcon: The main motorized device that reads, verifies, counts and collects bank notes and coupons.

Bank Notes: bills or currency

CPU: Central Processing Unit

DAC: Digital-to-Analog Converter

DIP-Switch: Dual In-line Package switch; setting of switches will allow the user to service the Currency Validator (i.e., perform VLA and program downloads).

EGM: Electronic Gaming Machine

GND: Ground

GPT: Global Payment Technologies, Inc.

GUI: Graphical User Interface

Glossary (Continued)

Host Controller: Refers to the computer or the embedded system that communicates with the Currency Validator.

Hot Plugging: An action that can damage the Currency Validator when the host machine's powered, interface-harness cable is attached to the Currency Validator's Main Connector Cable.

Idle State: The Currency Validator is operational and ready to accept currency.

IDS: International Down-Stack

Kernel Mode: Bootstrap routine needed to initialize CPU and upload an application to Currency Validator.

LED: Light Emitting Diode

MDB: Multi-Drop Bus; MDB protocol is primarily used in the vending industry to allow communication between the Currency Validator and the host machine.

OEM: Original Equipment Manufacturer

PAA: Protocol Adapter Assembly; a device that provides communication interface between the Currency Validator and the Host Controller; PAAs are available for industry-standard protocols that are commonly used for vending, gaming, and video lottery machines.

PC: Personal Computer

PCB: Printed Circuit Board

Protocol: Name of the communications interface used between the Host Controller and the Currency Validator.

Rejecting State: The Currency Validator has determined that the currency is not valid for acceptance.

RGBI: Refers to the Red, Green, Blue, and Infrared optical sensors that are used to validate currency.

SDA: Soft-Drop Analyzer

Sleep Activated: The Currency Validator awaits insertion of a bank note; during this time, unit draws minimal power – bezel LEDs are inactive; only front sensor LEDs and associated circuitry are active.

SRC: Security-Removable Cassette (i.e., *Stacker*)

Stacker: The non-technical, colloquial term that describes the device that stacks and stores bank notes and coupons (viz., *SRC*).

VAC: Volts Alternating Current

Validator State: an action that the Currency Validator is performing at any given instant in time.

Validator Event: a significant occurrence that has taken place in the Currency Validator (e.g., a bill being stacked).

VDC: Volts Direct Current

VLA: Video-Level Adjustment

This page left intentionally blank.

CHAPTER 1 – OVERVIEW

This Chapter Covers:

1. INTRODUCTION
2. SPECIFICATIONS
3. FEATURES
4. IDENTIFYING YOUR CURRENCY VALIDATOR
5. STACKERS

1.1 Introduction

Using advanced designs and electronics, *GPT* 's Falcon Currency Validator provides outstanding performance for fast, reliable bank note acceptance. Developed as a worldwide application Currency Validator, Falcon can process multi-country databases, consisting of up to 64 bank notes per database (between 60-mm to 78-mm in width), in four directions. Since Falcon fits into nearly all electronic vending, gaming, and beverage machines, it can replace most other models in the field.

Falcon, which can accommodate a variety of Stacker mounting positions, is available in three unique models, known as G3V, FL-4, and FL-6. All models are available with a choice of *GPT's* 200-, 400-, 600, or 1,000-bill Stackers. With Falcon's Model G3V series (see **Figure 1-1**), the unit can be can be positioned, with a rear-loading Stacker, in either an up- or down-stack orientation – merely turn the unit over. (To discharge bank notes from the bottom of the unit, *Falcon's* Model G3V can be configured with a deflector plate instead of a Stacker – obtain Expeller Kit, *GPT* PN 325K0002).

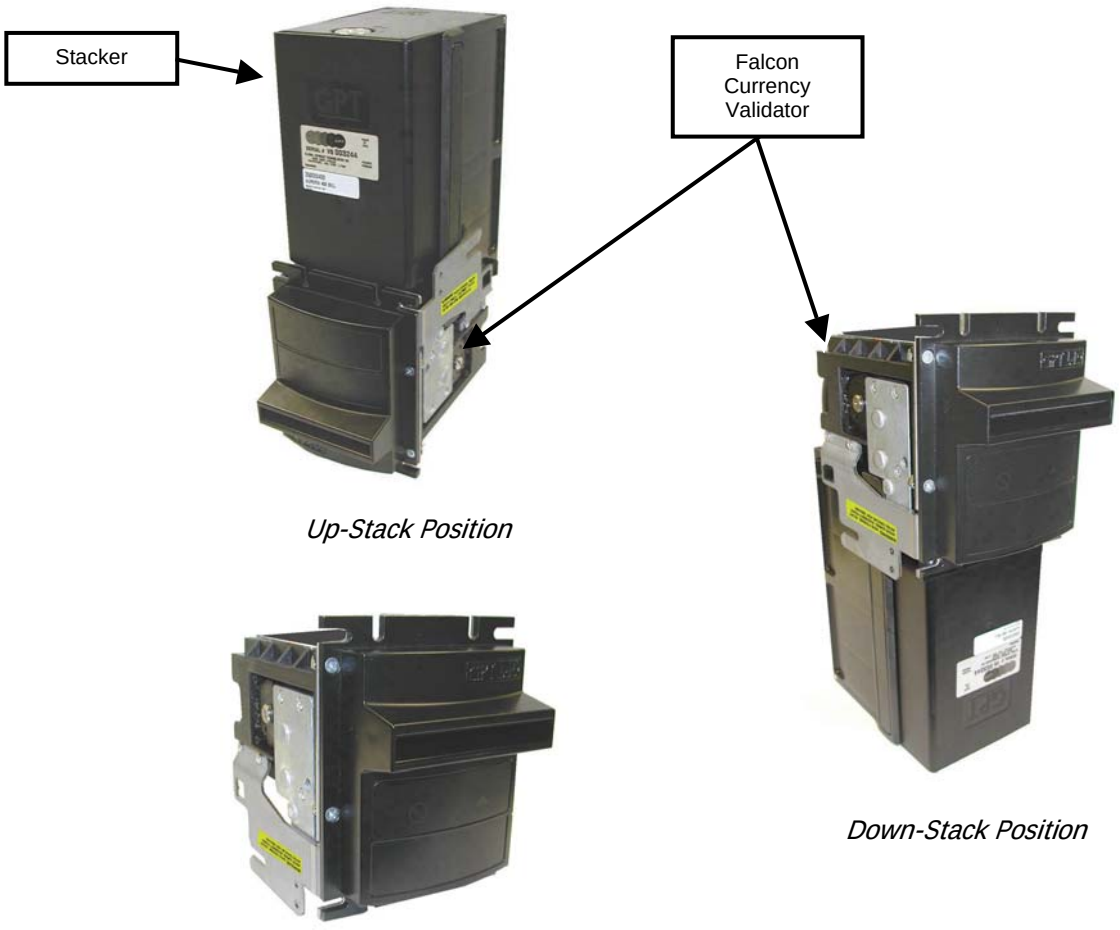


Figure 1-1. Falcon's Model G3V – Stacker Mounting Positions

For customers who require a gaming unit with a front-loading Stacker, Falcon's Models FL-4 and FL-6 series of validators are the ideal choices (see **Figure 1-2**). Model FL-6 was designed to mount directly into gaming machines with industry standard footprint.

Model FL-4 with 400-Bill Stacker

Model FL-6 with 400-Bill Stacker, IDS Bezel, and Enclosure

Figure 1-2. Falcon's Front-Load Stacker Units

Dependent upon customer requirements, Falcon can support Multi-Drop Bus (MDB), V2.2 RS-232, and ccTalk communication protocols. A single cable, with three connectors, makes hookup with the Host Controller quick and easy. Falcon can also communicate with vending and gaming machines that use other protocols (e.g., ID-003, A2/A2A, High-Level Pulse, VFM, Bally VFM® and IGT®); a Protocol Adapter Assembly is required for these protocols.

1.2 Specifications

The mechanical and electrical specifications of Falcon are:

- Bank Notes Accepted:

  Four-direction acceptance of bank notes from 60-mm (2.36-inches) to 78-mm (3.07-inches) wide; database supports up to 40-bill types for single country or 64-bill types for multi-country configurations.

- Optics:

  Uses Red, Green, Blue, and Infrared (RGBI) sensors to generate multi-channel optical information for a high-security validation process with a 5-second cycle-time (typical with a Stacker installed).

- Communications Interface/Protocols:

  For Model G3V: Multi-Drop Bus (MDB), V2.2 RS-232, or ccTalk
  For Model FL-4: MDB, V2.2 RS-232, or ccTalk
  For Model FL-6: V2.2 RS-232
  Optional Protocols: ID-003, A2/A2A, High-Level Pulse, VFM, Bally VFM® and IGT® protocols are available – a Protocol Adapter Assembly is required.

- Environment:

  Operating Temperature: –15°C to 65°C (5°F to 149°F)
  Storage Temperature: –30°C to 90°C (–22°F to 194°F)
  Humidity: 5% to 95% (non-condensing).

- Power Source Required – Standard Operating Voltages for Falcon are:

  For 24 VDC units: ELPAC Power Systems, Model FW5024 (24 VDC, 2.1 A, 50 Watts (max); Power Supply Adapter Cable Assembly (*GPT* PN 300EX009) is required

  For 12 VDC units: ELPAC Power Systems, Model FW3012 (12 VDC, 2.5 A, 30 Watts (max); Power Supply Adapter Cable Assembly (*GPT* PN 300EX009) is required

- Power Consumption:

  Idle State: 7 Watts (max.)
  Accepting/Stacking States: 24 Watts (max.)
  In-rush Current: 4.5 amperes (max., current limited) for 5 milliseconds at 24 VDC
  Sleep mode: 12V and 24V units draw 5.7 mA (max); 24V unit draws an additional 1.47 mA/volt above 29V.

- Compliance:

  ETL (UL-756)
  CETL (CAN/CSA C22.2 No. 950-95)
  Testable parameters comply with CE requirements for the 325G, 327G, and 328G series.

- Shipping Weight (Approximate):

  1.35 kg (2.96 lbs) without Stacker;
  2.15 kg (4.74 lbs) with 400-bill Stacker.

1.3 Features

The mechanical and electrical features of Falcon are described in the following sections.

1.3.1 Sensor Suite

Cross-sectional views of the sensor suite for the Lower- and Upper-Guide Optics Assemblies appear in **Figure 1-3**.

TBS

Left-Side View

TBS

Right-Side View

Figure 1-3. Sensor Suite – Cross-Sectional Views

1.3.1.1 Optics

Falcon identifies currency by using its Red, Green, Blue, and Infrared (RGBI) optical scanning array. This optical array generates multi-channels of high-resolution data. Using eight wide-area transmissive and reflective detectors, and 24 emitters, the optical array can analyze currencies, from 60- to 78-millimeters across the bill, without incurring any dead zones. This unique arrangement allows accurate bill recognition regardless of currency width. The four different wavelengths of emitters provide the ability to create databases for any country using only one configuration. The high-speed, low-noise analog-to-digital conversion circuits record multiple channels, and then processes the information to determine the validity of the bill within 5-seconds.

Internally, the Lower- and Upper-Guide Optical Assemblies are sealed to protect their electronic components against liquid, dust, or sand intrusion. To compensate for changing environmental conditions and degradation of emitters or detectors, optical adjustments are performed automatically during the *main idle* loop. This feature ensures that outstanding bill acceptance is achieved when a note is inserted.

1.3.1.2 Front and Rear Optical Sensors

Falcon uses front and rear optical sensors to detect critical information about the bank note's position in the currency channel. The front sensors will eject bank notes that are overly skewed. The rear optical sensors, which replaced the older style mechanical rear-flag sensors, are more sensitive and accurate than the mechanical rear-flag sensors.

1.3.1.3 Optical Anti-Stringing Detection

Falcon's Side-Looking Sensors™ (SLS), shown in **Figure 1-3**, are a precise optical system designed to detect fraud attempts. This design virtually eliminates the possibility of strings or tapes being used to *yo-yo* a bill from the Currency Validator.

1.3.2 Single-Head Configuration

Using a single-head design, Falcon can be programmed to accept currency found in *GPT*'s extensive database library. Falcon is configured to accept currencies from 60-mm to 78-mm wide. An all-plastic channel, with a positive-drive mechanism, is used to ensure that all types of paper or plastic currencies can easily pass, smoothly and evenly, through the currency channel.

1.3.3 Interface Connector(s)

Internally, Falcon can support one of these protocols: Multi-Drop Bus (MDB), V2.2 RS-232, or ccTalk. A single cable, with three interface connectors (see **Figure 1-4**), is used to apply the input power and the communication signals; for the pinout designations assigned to these connectors, refer to **Section 2.3**. Using either the MDB- or RS-232-type connectors, interconnection of Falcon with the Host system is quick and easy. These connectors can safely handle both power and interface requirements. Normally, connector designs are subject to *hot-plugging* risks that may damage either the Currency Validator or the Host machine. This risk is now eliminated with the power and interface electronics that are designed into Falcon.

Note: MDB connectors are color-coded to designate the proper input voltage required to operate your Currency Validator. White-colored connectors are used for units that require 24 VDC, and green-colored connectors are used for 12 VDC units only (*GPT* PN 325EC0010G).

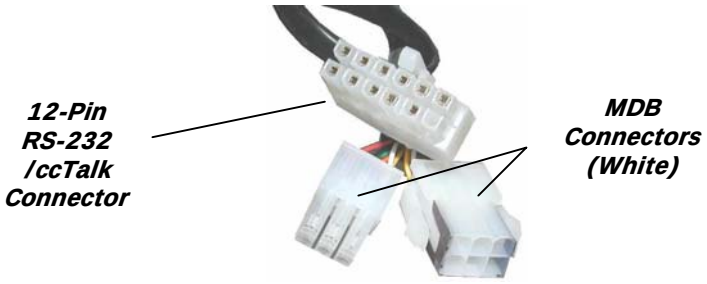


Figure 1-4. Falcon's Main Cable Assembly for 24V Units (*GPT* PN 325EC003G)

If your Host Controller uses ID-003, A2A, High-Level Pulse, or VFM protocol, an optional adapter, called the Protocol Adapter Assembly, is required. This device, which connects to Falcon via the RS-232-type connector, provides the appropriate cable/connector hookups to the Host Controller for the specified protocol. For information about using Falcon in your gaming or vending system, contact *GPT* Customer Service.

1.4 Identifying Your Currency Validator

Affixed to the cover of Falcon's Lower-Guide Assembly are the labels (i.e., Part Number, Program, Serial Number, and Origin Country Code) that identify the major characteristics of the unit (see **Figure 1-5**).

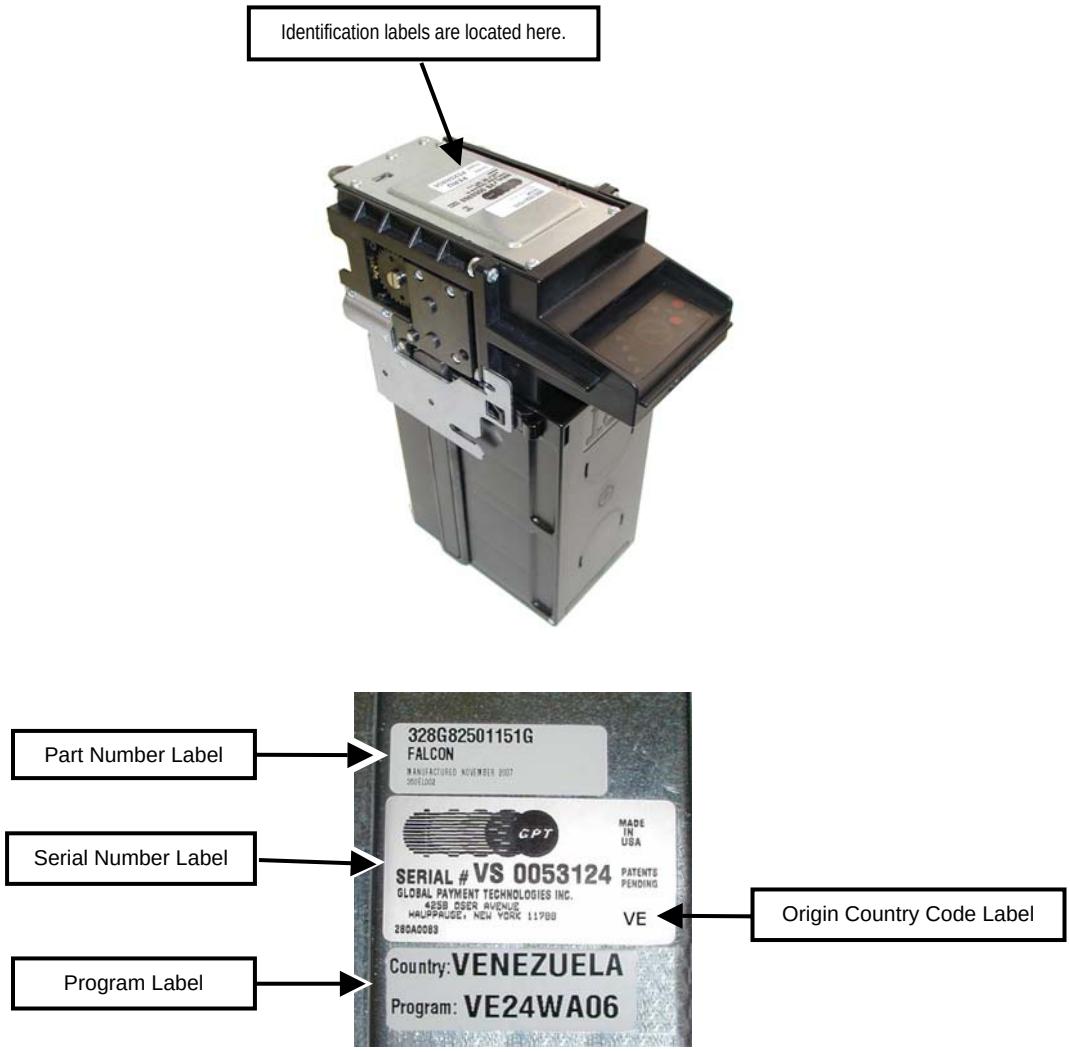


Figure 1-5. Currency Validator's Identification Labels (Typical)

The **Part Number** label specifies the date (i.e., month and year) that the Currency Validator was manufactured. It also uses an alphanumeric code that identifies the version number and the configurable components (i.e., mechanical and electrical) of the unit.

The numbering scheme for the **Part Number** label used for the back-load unit, Model G3V, is defined in **Figure 1-6**.

Note: Falcon's Model G3V series use the 325G and 327G designations in the numbering scheme of the Part Number label. The options for 325G series are identical to 327G series except as shown below.

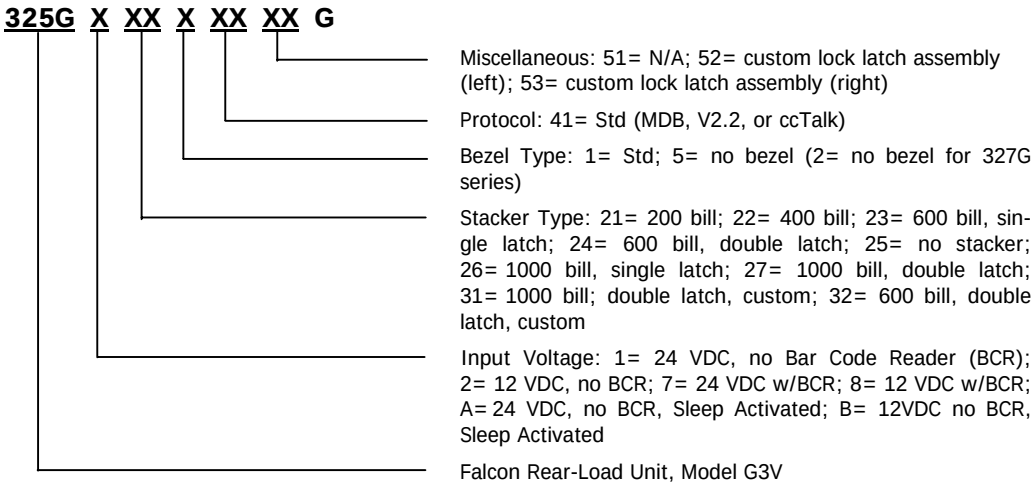

325G X XX X XX XX G
Miscellaneous: 51= N/A; 52= custom lock latch assembly (left); 53= custom lock latch assembly (right)
Protocol: 41= Std (MDB, V2.2, or ccTalk)
Bezel Type: 1= Std; 5= no bezel (2= no bezel for 327G series)
Stacker Type: 21= 200 bill; 22= 400 bill; 23= 600 bill, single latch; 24= 600 bill, double latch; 25= no stacker; 26= 1000 bill, single latch; 27= 1000 bill, double latch; 31= 1000 bill; double latch, custom; 32= 600 bill, double latch, custom
Input Voltage: 1= 24 VDC, no Bar Code Reader (BCR); 2= 12 VDC, no BCR; 7= 24 VDC w/BCR; 8= 12 VDC w/BCR; A= 24 VDC, no BCR, Sleep Activated; B= 12VDC no BCR, Sleep Activated
Falcon Rear-Load Unit, Model G3V

Figure 1-6. Part Number Label – Numbering Scheme for Model G3V

The following is an example of a part number for Falcon's Model G3V:

Sample Part Number: **325G 8 22 1 41 51 G**

where:

325G	is a Falcon Rear-Load Unit, Model G3V
8	indicates 12 VDC with BCR;
22	indicates 400-bill stacker;
1	indicates Std Falcon bezel;
41	indicates Std protocol;
51	not applicable (N/A);
G	indicates unit is ROHS-compliant.

The numbering scheme for the **Part Number** label for Falocn's front-load units, Models FL-4 and FL-6, is defined in **Figure 1-7**.

Note: Falcon's Models FL-4 and FL-6 series use the 328G designations in the numbering scheme of the Part Number label.

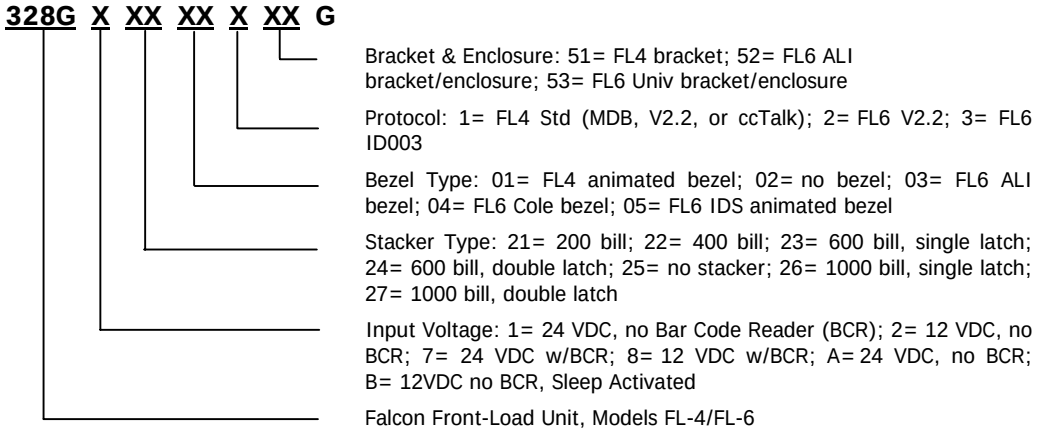

328G X XX XX X XX G
Bracket & Enclosure: 51= FL4 bracket; 52= FL6 ALI bracket/enclosure; 53= FL6 Univ bracket/enclosure
Protocol: 1= FL4 Std (MDB, V2.2, or ccTalk); 2= FL6 V2.2; 3= FL6 ID003
Bezel Type: 01= FL4 animated bezel; 02= no bezel; 03= FL6 ALI bezel; 04= FL6 Cole bezel; 05= FL6 IDS animated bezel
Stacker Type: 21= 200 bill; 22= 400 bill; 23= 600 bill, single latch; 24= 600 bill, double latch; 25= no stacker; 26= 1000 bill, single latch; 27= 1000 bill, double latch
Input Voltage: 1= 24 VDC, no Bar Code Reader (BCR); 2= 12 VDC, no BCR; 7= 24 VDC w/BCR; 8= 12 VDC w/BCR; A= 24 VDC, no BCR; B= 12VDC no BCR, Sleep Activated
Falcon Front-Load Unit, Models FL-4/FL-6

Figure 1-7. Part Number Label – Numbering Scheme for Models FL-4 and FL-6

The following is an example of a part number for a Falcon's Model FL-4:

Example: **328G 8 22 01 1 51 G**
where:

328G	is a Falcon Front-Load Unit, Model FL-4;
8	indicates 12 VDC with BCR;
22	indicates 400-bill stacker;
01	indicates FL4 animated bezel;
1	indicates FL4 Std protocol;
51	indicates FL4 bracket/enclosure;
G	indicates unit is ROHS-compliant.

The **Program** label identifies the country and contains an 8-digit alphanumeric code that defines the software characteristics of the Currency Validator. Two different numbering schemes are used to define single-country and multi-country databases (refer to **Section 3.1**).

The **Serial Number** label uses a unique alphanumeric code that identifies the Currency Validator.

The **Origin Country Code** mini-label, which is usually affixed onto the lower-right corner of the Serial Number Label, uses a two-letter ISO country code to indicate the country database that the Currency Validator was tested and shipped to.

The **CE/Warning** label (see **Figure 1-8**) indicates the Currency Validator complies with ETL and CETL requirements; an additional symbol appears for units that are ROHS compliant. This label also specifies the rated input power (i.e., voltage and current) that is required to safely operate the Currency Validator. The mounting location for the **CE/Warning** label is shown in **Figure 1-9**.

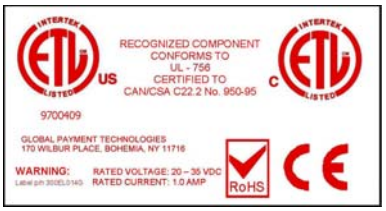


Figure 1-8. CE/Warning Compliance Label (Typical)

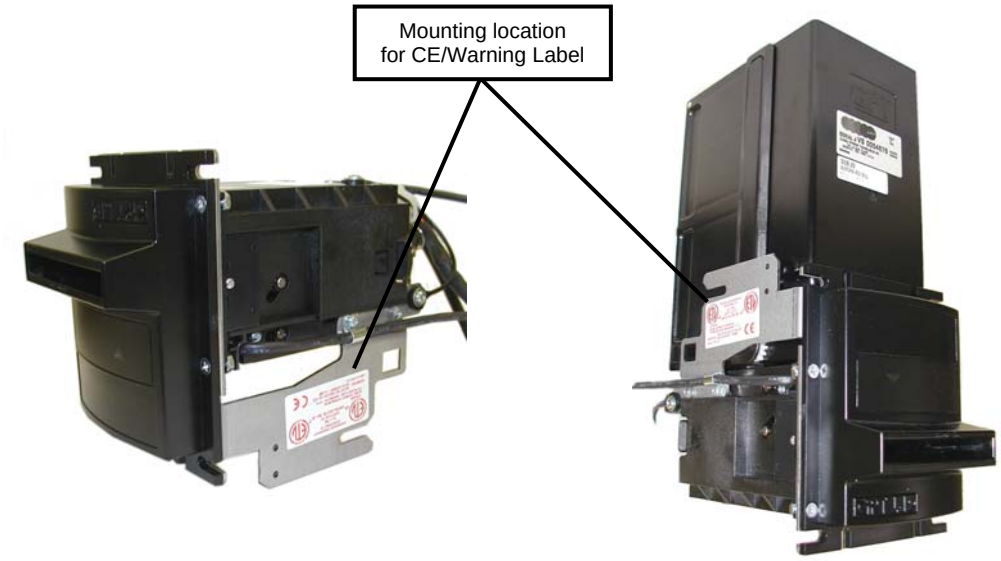


Figure 1-9. Mounting Location for CE/Warning Label

1.5 Stackers

Depending upon the currency sizes and quantities to be stored, *GPT* offers our customers a wide variety of Stackers (see **Figure 1-10**). The Stacker, which is designed with standardized components, provides error-free operation to secure up to 1000-stacked bills[2]. When the Stacker is full, it can be easily detached from the Currency Validator and sent to a remote location. The Stacker uses a door, with a key-lock, to secure the bills.

400-Bill Stacker *1000-Bill Stacker*

Figure 1-10. Falcon Stackers (Typical)

[2] ***GPT*** can also provide Stackers with 200 and 600-bill storage capacities. All storage capacities are approximate and are contingent upon the circulation quality of the currency.

This page left intentionally blank.

CHAPTER 2 – DESCRIPTION OF EQUIPMENT

This Chapter Covers:

1. UPPER-GUIDE ASSEMBLY
2. LOWER-GUIDE ASSEMBLY
3. STACKERS
4. PINOUT DESIGNATIONS

2.1 Currency Validator Major Assemblies

This chapter details the main components of the Falcon Currency Validator. Falcon's major assemblies are:

- Upper-Guide Assembly
- Lower-Guide Assembly

Upper-Guide Assembly

Lower-Guide Assembly

The Currency Validator features an all-plastic channel that is formed by the Upper- and Lower-Guide Assemblies. The Upper-Guide Assembly is attached to the Lower-Guide Assembly electronically by a connector cable. A plastic, strain-relief lanyard is used to protect the connector cable when the assemblies are separated for maintenance. The Main Cable Assembly, with its MDB and RS-232 Connectors which are part of the Lower-Guide Assembly, links Falcon to the Host Controller.

Physically, the Lower-Guide Assembly slides into the Upper-Guide Assembly, and is held together and aligned by the plastic side rails and channels. The two assemblies are locked into position by a spring-loaded lever latch on the Lower-Guide Assembly. The space between the assemblies becomes the currency channel, which starts immediately behind the bezel. The transport mechanics, which are split between and housed within the Upper- and Lower-Guide Assemblies, consist of three drive axles each with nylon pressure rollers.

2.1.1 Upper-Guide Assembly

The Upper-Guide Assembly serves as the top half of the currency channel. This Assembly contains and aligns the three drive axles (one front and two rear axles) with mounted rollers. The three drive axles provide traction to move the bank note past the validation circuitry and out of the unit. The drive axles are attached to self-tensioning mechanisms to assure a constant force against the three sets of counter-pressure rollers, ensuring a reliable and straight feed of the bank note. In a unique arrangement, the bill path is designed to provide an area suitable for the detection of stringing devices or tails by the Side-Looking Optical System™.

The Upper-Guide Assembly houses the Upper-Guide Optics Assembly with its sophisticated electronics and optical array sensors (see photo below). This sub-assembly, which is encased by a protective clear plastic that serves as the optical window, contains the intelligence that controls the functional, validation, communications, diagnostic, and display functions.

Upper-Guide Optics Assembly, GPT PN 325D0004-01

2.1.2 Lower-Guide Assembly

The Lower-Guide Assembly, which serves as the bottom half of the currency channel, uses nylon pressure rollers to guide the bank note through the channel and into the Stacker.

The Lower-Guide Assembly houses the Lower-Guide Optics Assembly with its sophisticated electronics and optical array sensors (see photo below). This sub-assembly, which is encased by a protective clear plastic that serves as the optical window, contains the intelligence that controls the functional, validation, communications, diagnostic, and display functions.

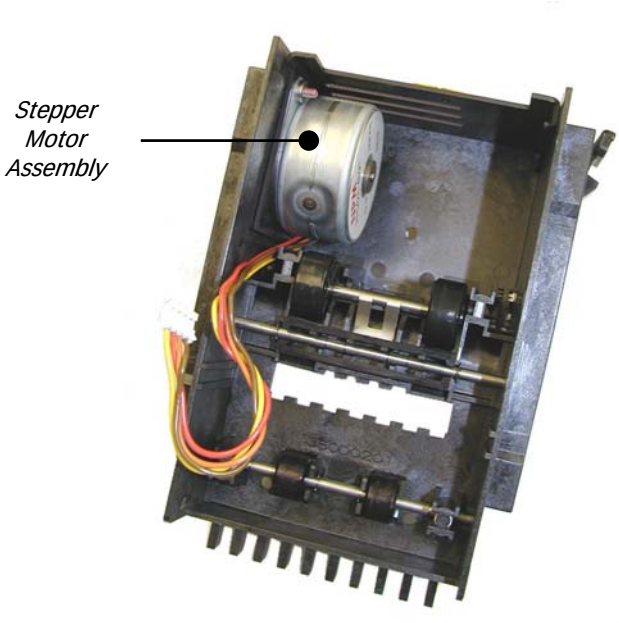
Lower-Guide Optics Assembly,

GPT PNs 325D0007-07 through 325D0007-12

Integrated into the Lower-Guide Optics Assembly is the Power Supply Regulator Assembly (see photo below). This device maintains constant output voltages (i.e., 3.3 VDC, 5 VDC, and 15 VDC) regardless of normal changes to the input or to the output load. Powered by an external power source (i.e., 12 VDC or 24 VDC power supply) within the Host system, the Power Supply Regulator Assembly controls the validation, communications, diagnostic, and display functions. To accommodate the power requirements of the Host system, *GPT* provides a 12 V and a 24 V Power Supply Regulator Assembly.

24V Power Supply Regulator Assembly, GPT PN 325EA004G-01

Integrated into the Lower-Guide Housing Assembly is the Stepper Motor Assembly (see photo below). This device accurately positions the bank note within the currency channel. During the bank note's transport process, the Stepper Motor allows the optical sensors to sample the bank note up to twenty times per second.



Lower-Guide Housing Assembly

2.2 Stackers

GPT 's Falcon Stacker is a dedicated, removable storage cassette that provides error-free operation and security for bank notes accepted by Falcon. For 60 to 78-mm wide notes, a variety of Stackers are available to provide storage capacities from 200 to 1000-stacked notes. Depending on the specific application, different levels of security may be provided for the removal and replacement of the Stacker.

All Stackers feature an electrical connector that self-aligns to the Currency Validator and joins electrically to it. The cassette's housing is constructed of durable, light-weight plastic and is designed so that access to the stored notes is only possible by unlocking the hinged door at the top of the module.

The cassette's major subassemblies are:

- Cash Box Assembly
- Motor Module and Stacking Mechanism Assembly.

2.2.1 Cash Box Assembly

The Cash Box Assembly (i.e., the cassette) features a minimum of joints, latches, and connectors; it is designed as an integral part of the Currency Validator and easily slides on and off the Upper-Guide Assembly. To prevent unauthorized entry, a hinged, locking door is secured with a tubular, tamper-proof key lock. The assembly contains a double spring-loaded pressure plate that supports the currency stack and a pair of support rails on which presented notes lie prior to the stacking operation.

2.2.2 Motor Module and Stacking Mechanism Assembly

The Motor Module and Stacking Mechanism Assembly contain a DC motor and a slider-crank mechanism that stacks bank notes in a simple and reliable manner. When the appropriate signal is received from the Currency Validator, the motor makes one revolution. This action cycles the pusher plate through one complete linear extension-retraction cycle. On extension, the pusher plate pushes the note past the support rails against the pressure plate. On retraction, the note is now trapped below the support rails and is held there by the pressure plate. The pusher plate continues to its retracted position and is ready for the next cycle.

2.3 Pinout Designations

Pinout designations for the voltages and signals that are required to safely operate the Currency Validator appear in this section.

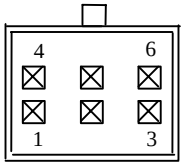
STOP

WARNING: PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT MAY RESULT BY APPLYING INCORRECT VOLTAGES TO THE CURRENCY VALIDATOR. ONLY APPLY THE VOLTAGE SPECIFIED ON THE CE/WARNING LABEL FOUND ON THE SIDE OF THE CURRENCY VALIDATOR AND/OR CASH BOX (see Figure 1-9).

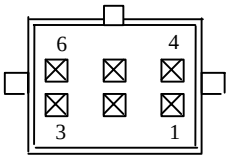
2.3.1 Input Power for 24-Volt Units

The pin-signal designations assigned to Currency Validators that require 24-volt input power are shown in **Figure 2-1**. A separate, remotely located power supply, which can generate 24 VDC, is required to operate the Currency Validator. An acceptable input voltage range is from 20 to 42.5 VDC.

6-Pin MDB Interface Connectors



(Pin-Side View)

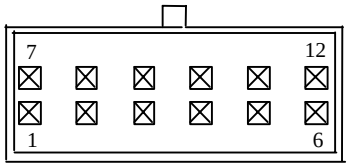


(Pin-Side View)

Pin 1: 34 VDC
Pin 2: 34 VDC Return
Pin 3: Sleep Output

Pin 4: Master RXD
Pin 5: Master TXD
Pin 6: Comm. Return

24 Volt, 12-Pin RS-232 Interface Connector



(Pin-Side View)

Pin 1: RS-232 GND
Pin 2: RS-232 RXD
Pin 3: + 5 VDC
Pin 4: Host_ON
Pin 5: GND
Pin 6: not used

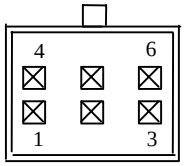
Pin 7: DATA/ccTalk
Pin 8: RS-232 TXD
Pin 9: SCL
Pin 10: SDA
Pin 11: 24 VDC IN
Pin 12: GND IN

Figure 2-1. Falcon's Main Cable Assembly – Pin-Signal Assignments for 24-Volt Units

2.3.2 Input Power for 12-Volt Units

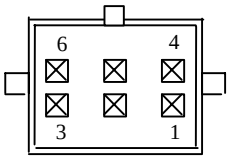
The pin-signal designations assigned to Currency Validators that require 12-volt input power are shown in **Figure 2-2**. A separate, remotely located power supply, which can generate 12 VDC, is required to operate the Currency Validator. An acceptable input voltage range is from 10 to 14 VDC.

6-Pin MDB Interface Connectors



(Pin-Side View)

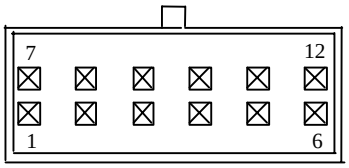
Pin 1: 12 VDC
Pin 2: 12 VDC Return
Pin 3: Sleep Output



(Pin-Side View)

Pin 4: Master RXD
Pin 5: Master TXD
Pin 6: Comm. Return

12 Volt, 12-Pin RS-232 Interface Connector



(Pin-Side View)

Pin 1: RS-232 GND
Pin 2: RS-232 RXD
Pin 3: +5 VDC
Pin 4: Host_ON
Pin 5: GND
Pin 6: not used

Pin 7: DATA/ccTalk
Pin 8: RS-232 TXD
Pin 9: SCL
Pin 10: SDA
Pin 11: 12 VDC IN
Pin 12: GND IN

Figure 2-2. Falcon's Main Cable Assembly – Pin-Signal Assignments for 12-Volt Units

This page left intentionally blank.

CHAPTER 3 – SOFTWARE / COMMUNICATION PROTOCOLS

This Chapter Covers:

1. SOFTWARE PROGRAM NUMBERING MATRIX
2. PROGRAM SPECIFICATION SHEETS
3. PROTOCOLS

3.1 Program and Database Assignments

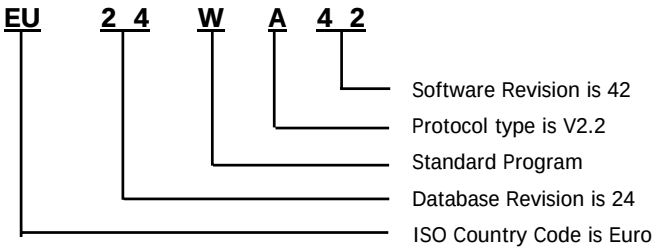
Program and database assignments for single-country and multi-country databases are shown in this section. *GPT* uses an 8-digit alphanumeric code, which is found on the Program Label (see **Figure 1-5**), to designate the country, protocol type, and database and software parameters for its Currency Validators.

The numbering assignments for a single-country database are defined as follows:

- The first two letters represent the ISO country code
- The next two digits specify the database revision (up to 99, maximum)
- The letter in the fifth position identifies the program required to operate the unit (i.e., **W** = standard; **M** = low power; **T** = stacker optional)
- The letter in the sixth position identifies the protocol type and the note-handling options at power up (i.e., **A** = V2.2; **M** = MDB generic; **G** = MDB customer specific – note exits to stacker at power up; **F** = MDB customer specific – note exits validator at power up)
- The last two digits specify the software revision.

Note: If a detailed description of this matrix is required, please contact the nearest *GPT* office.

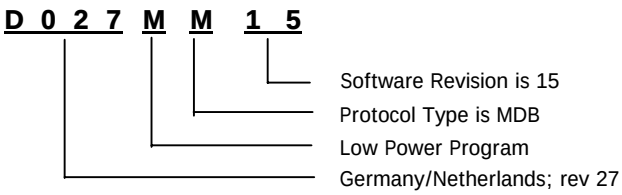
Definitions for the Program Label shown in **Figure 1-5** are:



The numbering assignments for multi-country databases are defined below:

- The first four characters define the multi-country database (i.e., one letter defines the countries, and three digits define the database revision).
- The next letter identifies the program required to operate the unit (i.e., **T** = stackerless; **W** = standard program; **M** = low power)
- The letter in the sixth position identifies the protocol type and the note-handling options at power up (same as for single-country database)
- The last two digits define the software revision.

Definitions of a typical Program Label for a multi-country database are:



3.2 Program Specification Sheets

Program Specification Sheets provide detailed information about the software loaded into the Currency Validator. To obtain information about the protocol, currency type, channel size, and DIP-switch settings for your Currency Validator, refer to *GPT's* Web site or contact Customer Service.

A sample Program Specification Sheet is shown in **Figure 3-1**. To address the different aspects of the software, the Program Specification Sheet is divided into the following sections:

- General – contains general characteristics such as the machine type, ISO code, program revision number, currency type, I/O protocols, and channel size; also, included are reference documents and additional program information.
- Currency/Codes of Bank Notes Accepted – lists bank notes and their associated VFM or Hex codes accepted by the program.
- Special Program Functions and References – defines protocols used with the Currency Validator; it also contains custom application information requested by the customer.
- DIP-Switch Functions and Definitions Table/Notes – identifies DIP-switch settings and defines the currency denominations/directions supported by the program.

Note: DIP switches are set to the **on** position when they are pointing toward their respective numbers.

Program Specification	USA	US30WA03

GENERAL			REFERENCE DOCUMENTS	
Machine Type	FALCON	RGBI	Currency Descriptor Specification	CDS6005
ISO Code	US		Interface Protocol Specification(s)	IPS7009
Program Revision No.	US30WA03			
Supersedes Program	NONE			
Currency Type	DOLLAR		Quality Assurance Summary	QAS654
I/O Protocol	V2.2			
Channel Size	3.08" (78 mm)		**Additional Program Information**	
VLA Paper Required	300EO005 / ARGUS 70MM			
Eng. Release Level	5		Magnetic Head Type	NONE
Eng. Release Date	1/10/2007		Source	SRC3

Note: All protocols other than V2.2, V1, and MDB are available only with External Protocol Adapter Box.

Currency/Protocol Information		
GPT Code	**Orientation**	**V2.2**
USD-1-1	ABCD	1
USD-10-2	ABCD	3
USD-10-3	ABCD	3
USD-10-4	ABCD	3
USD-20-2	ABCD	4
USD-20-3	ABCD	4
USD-20-4	ABCD	4
USD-5-2	ABCD	2
USD-5-3	ABCD	2
USD-50-2	ABCD	5
USD-50-3	ABCD	5
USD-50-4	ABCD	5
USD-100-3	ABCD	6

Figure 3-1. Sample Program Specification Sheet (Sheet 1 of 3)

Program Specification	USA	US30WA03

Special Program Functions and References

V2.2	
Reference Document	IPS7009
Description	This protocol contains features designed to detect transmission errors and allow for the retransmission of data in case an error occurs. It also allows full access to the validator's features and gives detailed information on the current state of the validator.

Custom Application Information	
Reference Document	None
Description	Standard V2.2 software

Program Changes	
Database Changes	Improved overall performance: US26
Source Code Changes	SRC03 – initial Falcon release

Security Option	
Reference Document	None

Inhibit Logic	
Reference Document	None

Software Disclaimer *

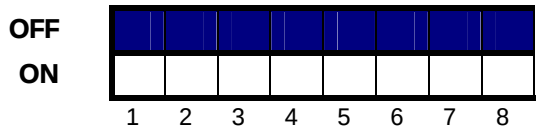
GPT shall make all reasonable efforts in creating software databases that will not accept any type of fraudulent or counterfeit notes. However, GPT cannot guarantee that such notes will not be accepted at any time in the future. Upon notification of such an event, GPT would make all reasonable efforts to enhance the software to eliminate this note. In no event will GPT be liable for damages, lost revenue, lost wages, lost savings or any incidental or consequential damages arising from acceptance of these type notes.

Figure 3-1. Sample Program Specification Sheet (Sheet 2 of 3)

Program Specification	USA	US30WA03

DIP-Switch Function Definition Table / Notes

DIP- Switch Factory Settings



The factory setting of all DIP Switches is the Off position.

The On position is defined as towards the numbers on the DIP Switches.

Function	DIP Switch							
	8	7	6	5	4	3	2	1
Service Mode Settings								
Download	on	on	on	X	X	X	X	X
VLA	on	on	off	X	X	X	X	X
Clear setup	on	off	on	on	on	on	on	on
Clear statistical buffer	on	off	off	on	on	on	on	on
cctalk: reset encryption key to 123456	on	off	on	off	on	on	on	on
Run Time Settings								
V1 Normal operation	off	off	On = Bill enables					
V2 Normal operation	off	off	X	X	X	X	X	X
MDB: Running with RS232 line	off	on	X	X	X	X	X	X
Running with MDB line	off	off	X	X	X	X	X	X
Running with max. response of 5 ms.	off	X	off	X	X	X	X	X
Running with max. response of 20 ms.	off	X	on	X	X	X	X	X
Running with 0 decimal place display	off	X	X	off	off	X	X	X
Running with 1 decimal place display	off	X	X	off	on	X	X	X
Running with 2 decimal place display	off	X	X	on	off	X	X	X
Running with 3 decimal place display	off	X	X	on	on	X	X	X
ID003 Normal operation	off	off	On = Coupon enable	On = Bill enables				
cctalk: Running without encryption layer	off	off	On = Bill enables					
cctalk: Running using encryption layer	off	on						

Note: The entry "X" denotes a don't care setting (i.e., on or off).

Figure 3-1. Sample Program Specification Sheet (Sheet 3 of 3)

3.3 Protocols

Internally, Falcon can support Multi-Drop Bus (MDB), RS-232 V2.2, and ccTalk communication protocols[3]. In addition to these protocols, *GPT* supports the other industry-standard protocols that are commonly used for video, vending, and gaming machines. For the industry-standard protocols, installation of a *GPT* Protocol Adapter Assembly (PAA) is required to allow communications between Falcon and the Host system.

3.3.1 Falcon Resident Protocols

Any one of the protocols, listed below, can be embedded in the unit's application software. Installation of Falcon is easily performed when either the MDB or the RS-232 serial interface-harness connector, as appropriate[4], is connected to the Host Controller. For pinout designations of the MDB and RS-232 connectors, refer to **Section 2.3**.

3.3.1.1 Multi-Drop Bus

The Multi-Drop Bus (MDB) protocol uses a serial bus operating at a speed of 9600 baud with a maximum of 32 peripherals or Currency Validators connected to the master controller. Each peripheral is assigned a unique address and command set.

When the master controller polls the bus for peripheral activity, the addressed Currency Validators can respond with either an acknowledgement byte or a data byte dependent on its current activity. The acknowledgement byte indicates if the validator has correctly received the message from the controller.

3.3.1.2 *GPT* RS-232 V2.2 Standard/Extended Protocol

The V2.2 protocol, which is based on RS-232 hardware standard, was designed by *GPT* to support all available validator features in the G2 and G3 product lines. All messages use the same frame to pass information or commands. Each message uses parity bit and check sum to identify transmission errors. The features of V2.2 are:

- Power-up detection
- Credit recovery procedure on power-up
- Supports 15 different note types and multi-country applications.

Protocol messages supply credit and currency type information to the controller. Both the controller and the validator must remain in constant communication or time-out errors will be generated. The V2.2 protocol meets or exceeds the requirements for the gaming industry for the security of transactions and will be modified, as needed, to meet future requirements. For more information about this protocol, refer to *GPT*'s ***V2.2 Standard Protocol Manual,*** **Pub. No. G9S2091**.

The command set in the V2.2 Extended protocol allows more information to be exchanged between the devices – it can accommodate up to 63 bill types and bar code coupon data in the database.

[3] The code for these three protocols is embedded in the unit's application software. Upon initial communication with the Host Controller at installation, Falcon will determine the appropriate protocol to be used.

[4] A Protocol Adapter Assembly is not required for the MDB, V2.2 (Standard or Extended versions), or ccTalk protocols.

3.3.1.3 ccTalk

ccTalk®, developed by Money Controls, is a serial communication protocol used for low speed, control networks. This protocol uses a three-wire interface consisting of power, data (bi-directional), and ground. The transmission specifications for ccTalk are:

9600 baud; 1 start bit; 8 data bits; even parity; 1 stop bit

3.3.2 Falcon Non-Resident Protocols

The following industry-standard protocols, with a *GPT* Protocol Adaptor Assembly, can be used with the Falcon Currency Validator:

- ID-003
- *GPT* High-Level Pulse
- *GPT* A2A Custom Parallel[5]
- VFM/GL5 Serial/Pulse
- IGT® 2.2
- IGT® 2.5

3.3.2.1 ID-003

The ID-003 Protocol, developed by JCM™, provides a two-way serial interface with the Host Controller. This protocol uses the polled or interrupt mode to communicate with the Currency Validator. In the polled mode, the Host Controller sends the Status Request Command to the Currency Validator and then waits for a response. Typically, the Currency Validator responds to most commands within 20 milliseconds. If a response (i.e., ACK command) is not received within 50 milliseconds, a communication error exists.

The ID-003 Protocol uses two types of interrupt modes called mode 1 and mode 2. For interrupt mode 1, the Currency Validator sends an enquiry message to the Host Controller when a status change occurs. In response, the Host sends the Status Request Command and the Currency Validator responds by issuing the status message. For interrupt mode 2, the Currency Validator sends an enquiry message only when certain status commands[6] are active (e.g., escrow, vend valid, and initialize). The power up and error status commands are issued for both interrupt modes. The transmission specifications for ID-003 Protocol are:

9600 baud; 1 start bit; 8 data bits; even parity; 1 stop bit

3.3.2.2 *GPT* High-Level Pulse

The High-Level Pulse protocol is available for those applications that have only a simple control board or control mechanism available. Using this protocol, the Currency Validator issues the Enable and Inhibit signals with Credit Pulses on the Normally Open (NO) contacts of the credit relay.

This protocol allows the user to choose one of the following timing modes:

1. 50 ms **on** time, with 50 ms **off** time (i.e., 50/50 timing), or
2. 60 ms **on** time, with 300 ms **off** time (i.e., 60/300 timing).

[5] A detailed manual that describes this protocol is available at *GPT's* Web site (http://www.gpt.com/T).

[6] The power up status and error status commands are also issued in interrupt mode 2.

The desired timing mode can be selected by a DIP switch in the protocol box (refer to **Table 2** of *GPT*'s, ***Installation of Protocol Adapter Assembly for G3V Vending***, Technical Bulletin No. **GPB3T04**, latest revision).

3.3.2.3 *GPT* A2A Custom Parallel

The A2A protocol is a custom-parallel protocol that enables the Currency Validator to communicate with a control system via a parallel port. Communication between the Currency Validator and the control system is unidirectional, that is, from the Currency Validator to the control system. Messages are transmitted to the control system via four lines on the Protocol Adapter Assembly.

The A2A protocol provides logic-level (TTL) parallel communications between the Currency Validator and the control system. When a bill is accepted, the Currency Validator generates the pulse ON, the pre-assigned line for the accepted denomination is low, while the remaining lines are high. Using this interface, the number of denominations placed in the program is limited to four.

3.3.2.4 VFM/GL5 (Serial/Pulse)

The VFM/GL5 Serial protocol (TTL/CMOS) provides one-way communication with the host computer. Using four control lines (i.e., ACCEPT, DATA, SEND, and INTERRUPT), messages are transferred between the Currency Validator and the control system. Two interfaces, serial and pulse, are available to permit maximum versatility.

While waiting for an event to occur, the Currency Validator is in the passive mode. When an event occurs, such as when a bill is being accepted, the Currency Validator will respond with a request to send a message to the control system. Using the handshaking method, messages emerge in the order of an 8-bit word (serial protocol).

3.3.2.5 IGT 2.2 and 2.5 (Domestic and Foreign)

Under contractual agreement with IGT®, this protocol is used widely by *GPT*. Please contact Customer Service for information about using this protocol with Falcon.

This page left intentionally blank.

CHAPTER 4 – THEORY OF OPERATION

This Chapter Covers:

1. FUNDAMENTAL OPERATION
2. CURRENCY VALIDATION PROCESSES
3. VALIDATOR STATES AND EVENTS

4.1 Fundamental Operation

Falcon uses multiple algorithms to validate currency. Each database is custom-designed for a particular set of denominations. Optical data from the Transmissive and Reflective Sensors is analyzed by the microprocessor along with data from the magnetic sensor. The entire note is scanned using all of the available colors (red, green, blue, and infrared), and the resulting data is processed until a decision is made to accept or reject the note.

A controller or host, with a MDB or RS-232 serial port capability, may remotely operate Falcon. Each bank note may be accepted or rejected at the discretion of the remote controller or host. Furthermore, options can be selected and credit information can be monitored. The remote controller can also override other programming facilities such as DIP-Switch settings and memory stored configuration data.

4.2 Currency Validation Processes

A detailed description of the currency validation process is described in the following subsections.

4.2.1 Power-Up Routine

The power-up routine begins when power is applied to the Currency Validator. The power-up routine for high-power operation (24 VDC) is described in the following steps (see **Figure 4-1)**:

a. The program checks the DIP-switches for setup information; normally, DIP-Switch 8 is set to the **off** position unless the unit requires service (e.g., VLA, download, clear setup, clear statistical buffer, or reset encryption key to 12345 for ccTalk).

b. The program checks memory for setup instructions; subsequently, it sets parameters and initializes registers.

c. The Currency Validator motor runs in reverse for about 2-seconds[7]; this action is necessary to clear a bill (i.e., bank note) or other foreign material from the channel. (If the bill is not successfully returned or stacked, the process is repeated; after the fifth attempt, the Host controller is notified that a jam exists and the Currency Validator is disabled.)

d. Stacker operation is verified by running the motor for two cycles.

e. The CPU enters the Idle State when at least one bank note denomination is enabled and the stacker is attached to the unit. In this state, the Currency Validator is operational (i.e., optical sensors are idle, and the CPU is polling the front sensors for activity) and is ready to accept currency; for bezel displays, refer to **Section 5.2**.

[7]This action does not occur for 12 VDC units.

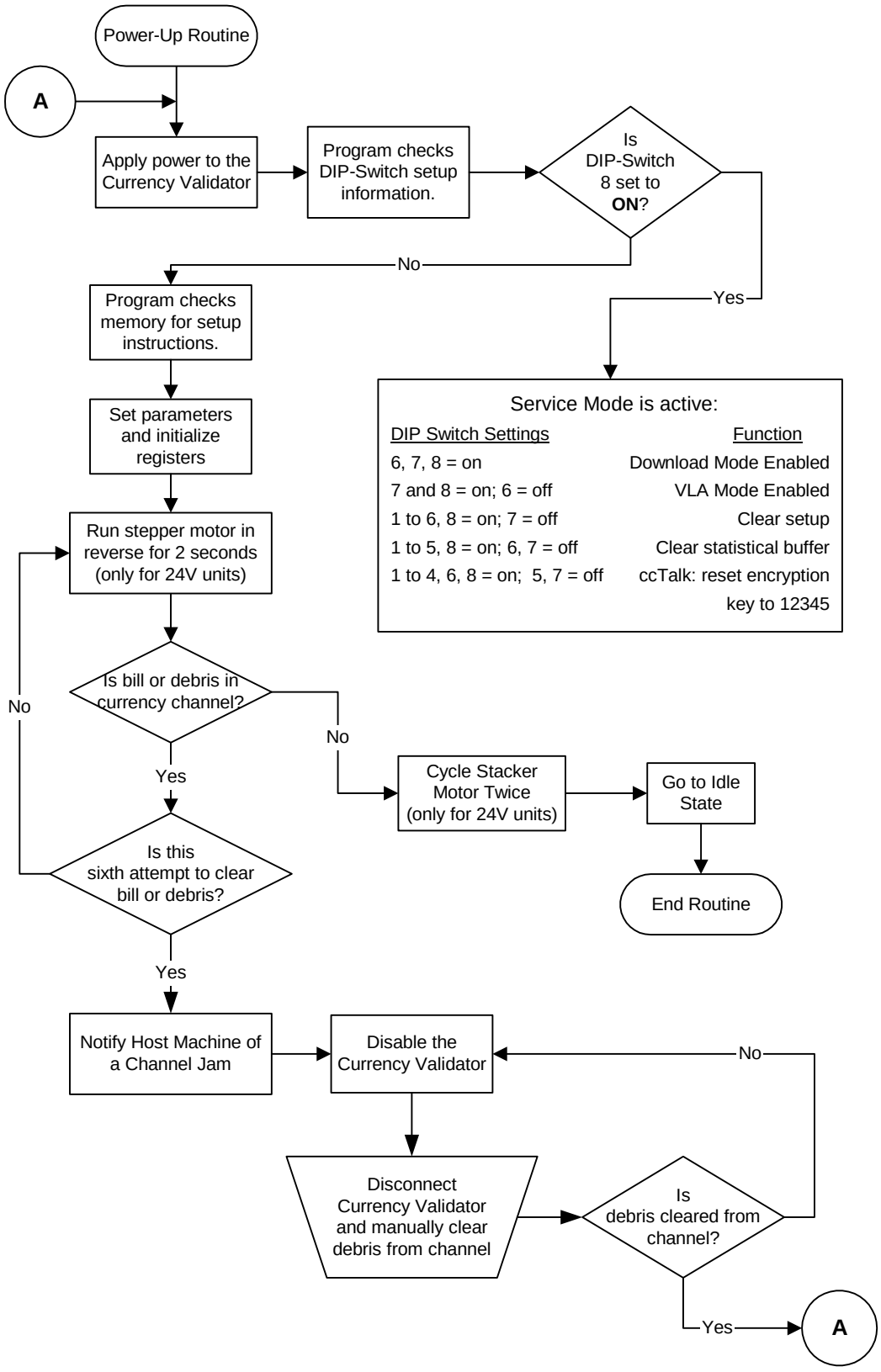

Power-Up Routine
A
Apply power to the Currency Validator
Program checks DIP-Switch setup information.
Is DIP-Switch 8 set to ON?
No
Yes
Program checks memory for setup instructions.
Set parameters and initialize registers
Run stepper motor in reverse for 2 seconds (only for 24V units)
Service Mode is active:
DIP Switch Settings
Function
6, 7, 8 = on
Download Mode Enabled
7 and 8 = on; 6 = off
VLA Mode Enabled
1 to 6, 8 = on; 7 = off
Clear setup
1 to 5, 8 = on; 6, 7 = off
Clear statistical buffer
1 to 4, 6, 8 = on; 5, 7 = off
ccTalk: reset encryption key to 12345
Is bill or debris in currency channel?
No
Yes
Cycle Stacker Motor Twice (only for 24V units)
Go to Idle State
End Routine
Is this sixth attempt to clear bill or debris?
No
Yes
Notify Host Machine of a Channel Jam
Disable the Currency Validator
No
Disconnect Currency Validator and manually clear debris from channel
Is debris cleared from channel?
Yes
A

Figure 4-1. Power-Up Routine Flow Chart for 24 VDC Units

4.2.2 Currency Validation Routine

Upon a successful power up, the Currency Validator enters the Idle State. In this state, it waits for a bank note to be inserted. When a bank note is inserted approximately 1-inch into the currency channel, the front sensors are activated. At this time, the currency validation routine begins:

a. The CPU starts the stepper motor in the forward direction; this action engages the bank note into the drive transport.

b. The CPU begins to collect and analyze optical data.

c. The rear sensor is activated, and the data collected is compared to a known database of programmed currency to determine the authenticity and denomination of the bank note.

4.2.2.1 Bill Acceptance Routine

When the Currency Validator has determined that the bank note (i.e., bill) is valid, it then begins the bill acceptance routine:

a. The CPU repeats its sensor checking routine.

b. The Currency Validator sends the valid bank note denomination message to the Host controller for disposition. Most protocols, excluding high-level protocol, allow the Host controller to force the Currency Validator to either accept a valid bank note or reject an invalid bank note. If the Host controller has instructed the Currency Validator to accept the bank note, the next step is performed; otherwise, if the bank note is not valid, the CPU begins the bill rejection routine (**Subsection 4.2.2.2**).

c. The bank note is moved to the SRC to be stacked (i.e., stacking state), thereby clearing the rear sensor. This sensor signals the CPU that the bank note has left the currency channel. In response, the CPU instructs the transport to continue running, for a fixed period, to ensure the bank note is out of the channel.

d. The CPU stops the stepper motor and starts the motor in the SRC.

e. After the bank note is successfully stacked, the Currency Validator informs the Host controller and updates its internal statistics.

Note: Credit is issued only after the bill is stacked.

f. The bill acceptance routine is now completed. The Currency Validator returns to the Idle State and is ready to process the next bank note.

4.2.2.2 Bill Rejection Routine

When the Currency Validator has determined that the bill is not valid, it then begins the bill rejection routine:

a. The CPU starts the stepper motor in the reverse direction to reject the bill from the channel (i.e., rejecting state).

b. If the bill transport cannot clear the channel, the CPU begins the channel clearing process. Using back and forth motions, the bill is jogged until it is freed from the channel and is returned to the customer. If necessary, the channel clearing process is repeated five times.

c. If the bill is successfully rejected during one of these attempts, the CPU returns to the Idle State. However, if the bill cannot be rejected after the fifth attempt, the CPU switches to the Inhibited State. In this state, the Currency Validator cannot operate until after the bill or debris is manually removed from the channel. After the channel is cleared, the CPU will return to the Idle State.

4.3 Validator States and Events

Definitions of the various validator states and events are defined in the following subsections.

4.3.1 Validator States

A *validator state* is the action that the Currency Validator is performing at any time. When a bank note moves through the Currency Validator, the unit changes states as it performs the functions necessary to validate and accept the bank note. The Currency Validator reports that it is in a certain state for as long as the state is active.

4.3.1.1 Idle State

The Currency Validator awaits the input of currency. In this state, the Currency Validator is operational and ready to accept currency.

4.3.1.2 Accepting State

The front sensor has been blocked and the bill is moving into the Currency Validator. The Currency Validator is in the process of evaluating the bank note to determine if it is valid.

4.3.1.3 Stacking State

The Currency Validator has determined that the bank note is valid and enabled for acceptance. The unit is in the process of moving the bank note into the stacker and stacking the bill therein. This state is exited after the bank note has been stacked, or when the stacker jams or is detected as full.

Note: For systems without stackers, the Stacking State is exited when the bank note clears the rear optical sensors.

4.3.1.4 Escrow State (only occurs if Escrow Mode is enabled)

The Currency Validator has determined that the bill is valid and enabled for acceptance. The bill is held in the channel for a specified period (10 seconds) while the Host controller commands the validator to accept or eject the bill. If the Host controller issues the Accept command, the Currency Validator proceeds to the Stacking State. However, if the controller issues the Eject command, the Currency Validator proceeds to the Returning State.

The Host controller can issue a **Hold** command causing the Currency Validator to wait an additional 10 seconds. This command may be repeated by the controller to hold the bank note in the Currency Validator.

Note: If the Host controller does not communicate with the Currency Validator within the period (approximately 10 seconds) to either accept or reject the bill, the Currency Validator will automatically reject the bill.

4.3.1.5 Returning State

The Currency Validator has determined or is being commanded to return a validated bill to the customer. This state is entered from the Escrow State when the **Return Bill** command is sent by the Host controller. It is also entered if, during the Stacking State, the Currency Validator is unable to move the bill into the stacker. This can be caused by a mis-feed of the bill or an attempted tampering of the Currency Validator by the customer, (e.g., *stringing* a bill). Consequently, credit should not be given by the controller. The Currency Validator will exit from this state when the bill is ejected from the channel.

4.3.1.6 Rejecting State

The Currency Validator has determined that the bill is not valid for acceptance. This can be due to a mis-feed, currency that does not meet the criteria for validation, or a denomination that is not enabled. Whatever the reason, the bill is in the process of being rejected and returned to the customer. Upon the successful ejection of the bill, the Currency Validator returns to the Idle State.

4.3.1.7 Inhibit State

A *fault condition* has occurred which inhibits the operation of the Currency Validator. In this state, the Currency Validator will self-inhibit and will stop accepting currency. The fault may be temporary and will clear automatically or it may require that the Currency Validator be serviced.

The following list identifies the most common conditions that can cause the Currency Validator to enter the Inhibit State:

a. A bill is jammed in the channel and the Currency Validator is unable to move it out of the channel and return it to the customer.

b. The Currency Validator is unable to stack the previous bill (Stacker Jam). The Stacker is full or is removed.

c. The Currency Validator's self-test routine has determined that a hardware fault exists and it is unable to operate. The validator will attempt to correct the fault, and if successful, will exit the Inhibit State. If the fault is externally cleared, the Currency Validator will also exit the Inhibit State.

d. Stacker is required but is not present; this condition can be nullified if the Host Controller sends the Set Stacker Optional for Operation Mode command. Since this command disables the stacker checking routine, the validator would exit the Inhibit State and enter the Idle State (provided no other inhibit conditions exist).

e. All bills are disabled.

When the Currency Validator enters a non-operational state and manual intervention is required to correct the problem, then the Validator Disabled Flag will be set. This condition can occur after attempts made by the Currency Validator to clear the jam have failed. It can also occur if the Stacker is removed, or an uncorrectable hardware fault is detected (i.e., Stacker Required for Operation Mode).

4.3.2 Validator Events

A *validator event* is some significant occurrence that has taken place in the Currency Validator, for example, a bill being stacked. When an event occurs, a flag is set in the Currency Validator software. When the Currency Validator status is reported, the flag is cleared. Consequently, the event is only reported once to the controller for each time it happens. The validator events and their descriptions are listed below:

4.3.2.1 Bill-Stacked Event

A valid bill has been stacked (or for Stackerless units moved past the rear optical sensors), and the bill cannot be returned to the customer. This event signals the successful completion of a bill transaction. The controller may now issue credit for the bill. This is the ONLY time the controller should issue credit. After a bill is stacked, a status request message must be received by the Currency Validator before it will accept another bill. This prevents the loss of credit by the customer, if the controller fails to poll frequently enough.

4.3.2.2 Bill-Returned Event

The bill has been successfully ejected from the Currency Validator and is returned to the customer. This event may occur even if a stack bill command was given, if the Currency Validator was unable to complete that command.

4.3.2.3 Cheated Event

The Currency Validator detected an attempt by the customer to remove a bill from the escrow position. The validator will automatically go to the Returning State and will try to eject the bill. A Bill-Returned-Event flag will be generated, when the bill has been ejected. The controller should cancel the transaction.

4.3.2.4 Power-On Reset Event

The Currency Validator has been started up from the Power Down State. This flag is set during Currency Validator initialization. If it occurs in other than initial power-up of the system, it means the Currency Validator has lost power.

4.3.2.5 Power Up with Credit Recovery Event

This event occurs when power is applied to the Currency Validator and the currency channel is not empty. The channel may contain a bill or some type of foreign material. During power up, the Currency Validator will check if a bill was in the process of being stacked during the last power down. The time required for a bill being stacked is defined as the interval when the bill clears the rear sensor and before the response to a status command with the Bill Stacked Flag set. In this case, the first status command will be answered after the Currency Validator is powered up. The Bill Stacked bit will be set and the Bill Type field will contain the bill type of the valid bill. The Power-On Reset Flag, Idle Flag, and Communication Time-Out Flag will be set simultaneously.

Note: Since the Bill Stacked Flag is not preceded by the Accepting Flag or the Stacking Flag, it is recommended that the Host Controller send the Status Request command as soon as power is restored.

4.3.2.6 Communication Time-Out Event

This event occurs when the Currency Validator does not receive a valid message from the Host controller within a specified period. Subsequently, the Currency Validator enters the Inhibit State.

Note: To receive this message, contact with the Currency Validator must have been re-established. This message indicates that a failure had occurred.

CHAPTER 5 – DIAGNOSTICS

This Chapter Covers:

1. GENERAL INFORMATION
2. BEZEL LED CODES FOR MODEL G3V
3. RED STATUS LED
4. BEZEL DISPLAYS FOR MODELS FL-4 AND FL-6
5. TROUBLESHOOTING

5.1 General Information

Falcon communicates diagnostic information and Host machine status to service personnel via the LEDs on its bezel. Various bezel LED codes indicate the state of the unit and denote when an equipment malfunction has occurred. In addition to the bezel LEDs, a red Status LED, which is located at the rear of all Falcon models, allows the technician to view the status codes while troubleshooting the unit at the rear of the Host machine.

5.2 Bezel LED Codes for Model G3V

The bezel used on Model G3V units contains two LEDs (i.e., green and red). On power-up, Falcon performs a self-test routine[8]. If the unit is operational, only the green LED will be lit (i.e., *Idle State*). However, if a malfunction is detected, both the green and red LEDs will be flashing. Definitions of the bezel LED codes, shown in **Table 5-1**, reflect the condition of the unit for the normal and abnormal states.

Table 5-1. Bezel LED Codes for Model G3V

Bezel LED Codes	Description of Code
Green LED is continuously lit and red LED is off.	Falcon is in the *Idle State* and ready to accept currency.
Green LED is off and red LED is flashing.	VLA Mode is enabled; Falcon is waiting for insertion of VLA Card.
Green LED is off and red LED is continuously lit.	*Inhibit State* is enabled.
Green and red LEDs are flashing sequentially.	Error condition exists. To determine the appropriate Error Code, count the number of times the red LED flashes between flashes of the green LED. Descriptions and remedies of the error codes are defined below: **Error Codes** — **Description and Remedy** 1 — Front Sensors are blocked. Remove object from the Front Sensor area. 2 — All notes are disabled. Check that Host has enabled at least one denomination. 3 — Rear Sensor is blocked. Remove object from the Rear Sensor area. 4 — Channel is jammed. Remove the note or object from the channel. 5 — Channel is open. Fully insert the Lower-Guide Assembly into the Upper-Guide Assembly; ensure the spring-loaded Lever Latch is engaged. 6 — Unit does not detect a Stacker when a Stacker is required for system operation. Install a Stacker. 7 — A full Stacker is detected. Empty the Stacker. 8 — Stacker failed to start or the time allowed to complete the cycle was exceeded. Replace the Stacker. 9 — Unit is disabled by a command from the Host. Host must send a command to enable the unit.

[8] For normal operation, ensure DIP-Switches 1 through 8 are set to the **off** position.

Table 5-1. Bezel LED Codes for Model G3V

Bezel LED Codes	Description of Code
Green and red LEDs are flashing sequentially.	Error condition exists. To determine the appropriate Error Code, count the number of times the red LED flashes between flashes of the green LED. Descriptions and remedies of the error codes are defined below:

Error Codes	Description and Remedy
10	Unit has not received messages from the Host before the protocol (i.e., MDB or V2.2) specific timeout period has elapsed. Check host and associated cabling.
11	Error occurred while trying to send credit to the Host. Host did not acknowledge credit message. Check cabling.
12	Error occurred in the Protocol Adapter Assembly. Replace Adapter.
13	Slow Rear Flag – credit will not be issued. Remove object blocking the Rear Flag Sensor.
14	Unit's internal temperature exceeds operating range. Ensure Host machine's cooling fans are operating.
15	Video adjustment failure. Unit did not successfully complete VLA (e.g., incorrect paper medium and/or failed optics).
16	System error, a fault is detected in the software controlling the unit. Check program; run CRC and, if necessary, reload program.
17	Unit hardware error. Download the applicable MDB or V2.2 program (if not loaded) and use the diagnostics command to display the particular fault.
18-20	Not used.

5.3 Red Status LED

A red Status LED, which is located at the rear of the unit, is provided for all Falcon models (see **Figure 5-1**). This feature allows the technician to view the LED error codes while troubleshooting the unit in the Host machine; for definitions of all error codes, refer to **Table 5-1**; during normal operation, the Status LED will flash once per second.

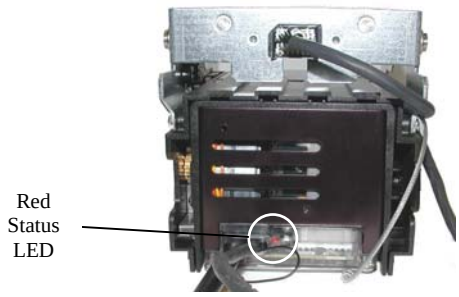


Figure 5-1. Location of Red Status LED

5.4 Bezel Displays for Models FL-4 and FL-6

This section provides sample bezel displays that represent programmed patterns for V2.2 protocol used by Models FL-4 and FL-6.

5.4.1 Displays for Normal Equipment Operation

As the bill moves through the currency channel, light patterns that appear on the animated bezel identify the current state of the unit. On power-up, the Currency Validator performs a self-test routine. If the unit is operational, the bezel will show a runway light pattern. However, if a malfunction is detected, a self-diagnostic error display will occur as described in **Subsection 5.4.2**.

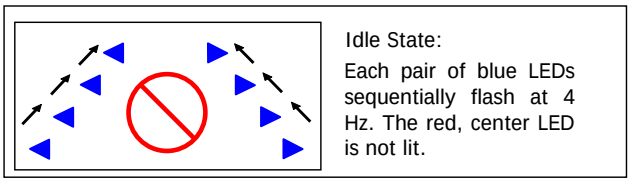
Notes:

1. The lit, blue LEDs are represented by the solid, triangular-shaped symbols.

2. If an equipment malfunction occurs, the Currency Validator will not accept the bill (refer to Subsection 5.3.2).

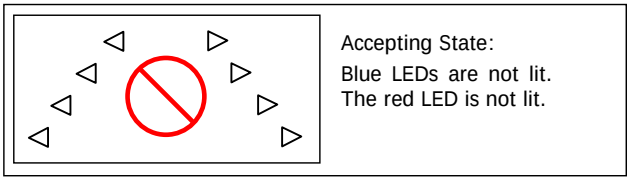
- *Idle State*

  The Currency Validator is operational and ready to accept a bill.



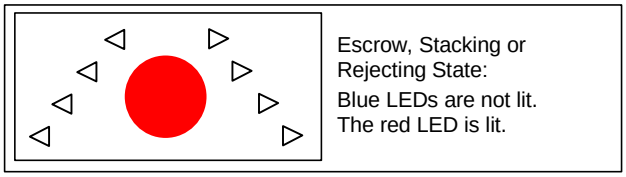
- *Accepting State*

  A bill is inserted into the Currency Validator. The front sensor is activated, and the unit is accepting data and evaluating the bill to determine if it is valid.



- *Escrow State, Stacking State, and Rejecting State*

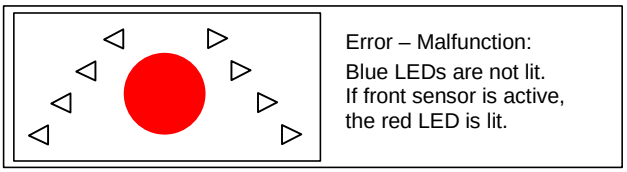
  When the Currency Validator enters the Escrow State, the Stacking State, or the Rejecting State, the light pattern shown below appears.



5.4.2 Self-Diagnostic Error Displays

Besides the light patterns in **Subsection 5.4.1**, the Currency Validator provides self-diagnostic error displays when an equipment malfunction occurs. The most common types of errors appear below. For corrective actions, refer to Troubleshooting (**Section 6**).

- *Any one of the following conditions can cause this display:*



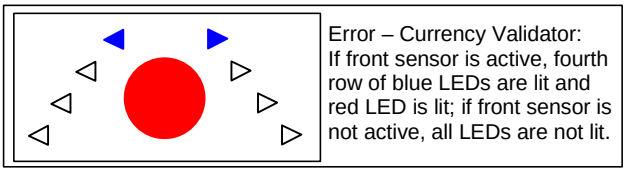
Error – Malfunction:
Blue LEDs are not lit.
If front sensor is active, the red LED is lit.

(1) A bill is inserted in the channel but does not advance into the channel.

(2) Stacker is not connected to the Currency Validator and Stacker Required Mode is enabled.

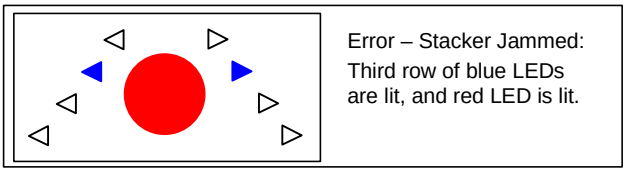
(3) The Currency Validator is operational but has been inhibited (i.e., Inhibit State) from accepting bills. This condition can be caused by an inhibit command issued by the controller or a communication failure between the equipment.

- *Bill jams in the channel – middle sensor is covered.*



Error – Currency Validator:
If front sensor is active, fourth row of blue LEDs are lit and red LED is lit; if front sensor is not active, all LEDs are not lit.

- *Stacker is jammed or full.*



Error – Stacker Jammed:
Third row of blue LEDs are lit, and red LED is lit.

5.5 Troubleshooting

The possible causes and corrective actions for malfunctions associated with Currency Validator (refer to **Table 5-2**) and Stacker (refer to **Table 5-3**) appear in this section. If Currency Validator does not complete its self-test routine or does not display its bezel LED codes satisfactorily, then a physical inspection of the unit and its operation may be necessary to isolate the malfunction. If corrective action fails to resolve the problem, contact Customer Service for assistance.

Table 5-2. Falcon Troubleshooting Chart

Symptoms	Possible Causes	Corrective Action(s)
1. Currency Validator is not working; bezel LEDs are not lit.	• External power is not applied to the Currency Validator.	• Verify that power and ground are connected to the appropriate pins on the main connector.
	• Damaged MDB or RS-232 interface connector and/or pins.	• Check for bent, missing or damaged pins in the appropriate connector.
2. Bills jam in the channel.	• Drive Rollers and/or Pressure Rollers are dirty, damaged, or loose.	• Clean the exposed Drive Rollers and pressure Rollers (refer to **Section 6.2**).
	• Foreign objects appear in channel.	• Remove foreign objects from channel; ensure channel is free of debris.
	• Upper-Guide and Lower-Guide Assemblies are not properly engaged.	• Ensure that Lower-Guide Assembly is securely latched to Upper-Guide Assembly.
	• Rear Sensor Prism is loose, misaligned, or has fallen off.	• Replace Rear Sensor Prism (refer to **Subsection 7.4.2.4**).
3. At power up, Currency Validator cycles and red LED is lit.	• Obstruction is blocking the front sensors.	• Clean front sensors (refer to **Section 6.2**).
4. Currency Validator disabled after power up; green bezel LED is not lit.	• Side-Looking Sensors (SLS) are blocked: lens is dirty, scratched, or damaged.	• Clean SLS lens (refer to **Section 6.2**).
	• Upper-Guide and Lower-Guide Assemblies are not properly engaged.	• Ensure that Lower-Guide Assembly is securely latched to Upper-Guide Assembly.
5. No communications with host controller.	• MDB or RS-232 interface-connectors are not properly attached to host machine.	• Ensure RS-232 or MDB interface connectors are securely attached to harness of host machine.
	• Power is not getting to switching regulators.	• Reload program software.
	• Corrupted EEProm.	• Perform VLA (refer to **Subsection 6.3.1**).

Table 5-3. Stacker Troubleshooting Chart

Symptoms	Possible Causes	Corrective Action(s)
1. Stacker Malfunctions.	• Stacker's entry slot is blocked by the Pusher Plate.	• Check Stacker's entry slot for possible damage and/or blockage. Also, check slide guide for damage (refer to **Subsection 6.4.3**).
	• Foreign object is jamming the drive gears.	• Remove foreign objects from drive gears.
	• Stacker may be full.	• Remove cash from Stacker.
2. Bills jam in Stacker.	• Dirty bill guides or foreign object(s) in the Cash Box.	• Clean bill guides; remove foreign objects (refer to **Subsection 6.4.3**).
	• Stacker may be full.	• Empty cash from Stacker.
3. Currency Validator reports a Stacker jam, but bill is not jammed in Stacker.	• Pusher Plate Sensor is damaged and it does not allow Pusher Plate to return to the top-most position.	• Replace Stacker.

This page left intentionally blank.

CHAPTER 6 – PREVENTIVE MAINTENANCE

This Chapter Covers:

1. GENERAL INFORMATION
2. PERIODIC CLEANING
3. CALIBRATION & BENCH TESTING
4. SUPPLEMENTAL SERVICE PROCEDURES

6.1 General Information

Depending on its environment and usage, the Currency Validator may require periodic cleaning to restore the unit to optimum performance. Under normal use, the Currency Validator should be checked every 6 to 12 months. For unusual operating conditions, such as when the unit is exposed to dirt, dust, water spray, airborne oil and/or sand, more frequent cleaning will be required.

6.2 Periodic Cleaning

Visual inspection and cleaning are the only preventive maintenance actions required for the Currency Validator. To remove dirty deposits and smudges from the bezel and other surfaces of the Currency Validator, use a soft, lint-free cloth, dampened with a 90-percent solution of isopropyl alcohol only.

CAUTIONS:

1. DO NOT allow an Electrostatic Discharge (ESD) to damage the validator's electronic components; follow all industry-accepted ESD-prevention procedures.
2. DO NOT flood the bezel area with liquids, as this can damage the electronics within the bezel.

6.2.1 Cleaning Currency Channel

With constant use, a buildup of dirt, which is transferred from the surface of the bills, will accumulate on the pressure rollers, drive rollers, and optics. Periodically, these items should be cleaned to ensure reliable operation.

6.2.2 Required Items

The items required to clean the Currency Validator are:

- Soft, lint-free cloth
- Isopropyl alcohol (90-percent solution).

6.2.3 Procedure

To clean the Currency Validator, follow these steps:

WARNINGS:

1. AVOID PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE CURRENCY VALIDATOR. DISCONNECT POWER SUPPLY BEFORE CLEANING OR PERFORMING MAINTENANCE ON CURRENCY VALIDATOR.
2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CLEAN OR REPAIR THE CURRENCY VALIDATOR IN A DAMP OR WET ENVIRONMENT.
3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CLEANING OR PERFORMING MAINTENANCE ON CURRENCY VALIDATOR.

1. Power down Currency Validator and disconnect Host machine's Main Connector Cable from Currency Validator's MDB or RS-232 Serial Connector.
2. Remove Currency Validator from its mounting frame.

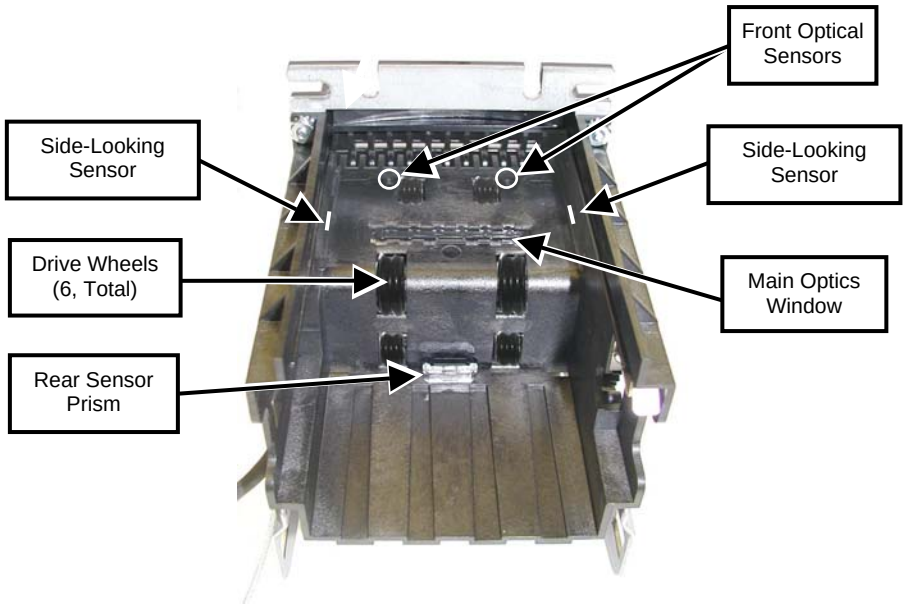
CAUTIONS:

1. DO NOT scratch the surfaces of the optics window while cleaning these components, as this can impair the Currency Validator's performance.
2. DO NOT allow liquid to enter the unit, as this can damage components.
3. DO NOT use unapproved cleaners, as this can cause permanent surface damage; use only cleaners as directed in this procedure.
4. DO NOT use cotton swabs to clean the unit, as this can leave unwanted material on the surfaces.

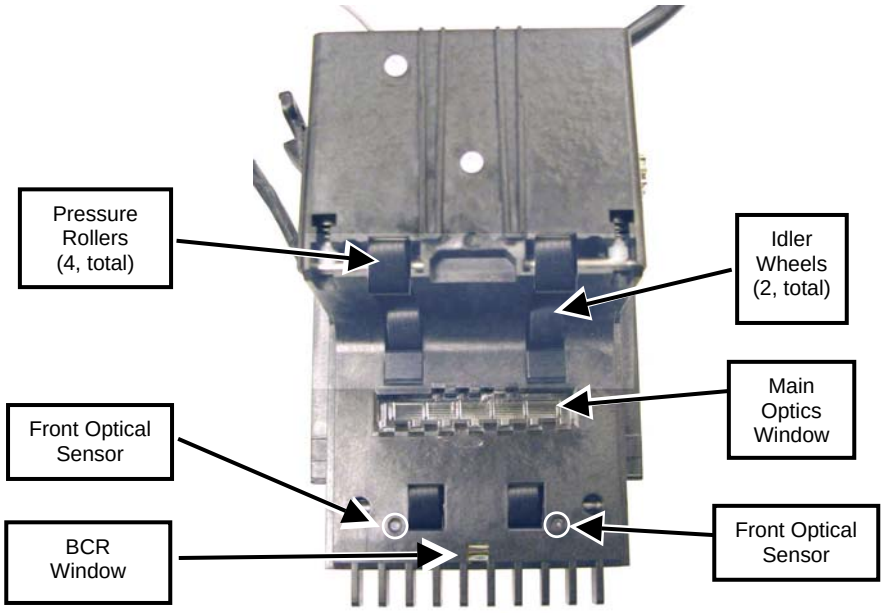
3. Remove Stacker or Expeller (i.e., Bank Note Deflector), as appropriate.
4. Depress spring-loaded Lever Latch at rear of validator head and pull Lower-Guide Assembly out of Upper-Guide Assembly to expose the currency channel.
5. Using a soft, lint-free cloth dampened with 90-percent isopropyl alcohol, clean the following areas (see **Figure 6-1**):
   a) Currency channel surfaces: remove any surface dirt on both upper and lower guides.
   b) Main Optics window area: clean optics window surfaces (Upper- and Lower-Guides).
   c) Drive Wheels: clean wheels on Upper-Guide Assembly.
   d) Pressure Rollers and Idler Wheels: clean roller and wheel surfaces on Lower-Guide Assembly.
   e) Side-looking Sensors: clean sensor surfaces.
   f) Bar-Code Reader (BCR) window area: clean window surface on Lower-Guide Assembly.

WARNING: PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT MAY RESULT BY APPLYING INCORRECT VOLTAGE TO THE CURRENCY VALIDATOR. ONLY APPLY VOLTAGE SPECIFIED ON THE C/E WARNING LABEL.

6. Rejoin Upper- and Lower-Guide Assemblies.
7. Attach Stacker or Bank Note Deflector, as appropriate.
8. Perform Video-Level Adjustment (refer to **Subsection 6.3.1**)
9. Perform Functional Test (refer to **Subsection 6.3.2**) and/or Service Acceptance Test (refer to **Subsection 6.3.3**).
10. Reconnect electrical cable, and restore power to the unit.



Upper-Guide Assembly



Lower-Guide Assembly

Figure 6-1. Currency Channel - Cleaning Surfaces

6.3 Calibration and Bench Testing

This section provides the procedures to calibrate and bench test certain electrical and mechanical components of the Currency Validator. *GPT* recommends that the Currency Validator is tested prior to servicing or before it is shipped to *GPT* for repair.

Calibration and/or bench testing, which is limited to the following items only, should be performed after the Currency Validator is cleaned, repaired, or is not operating properly:

- Video-Level Adjustment
- Functional Test
- Service Acceptance Test.

6.3.1 Video-Level Adjustment

The Video-Level Adjustment (VLA) is used to optimize the performance of the Currency Validator. Using an Falcon-specific VLA card only, the service technician can calibrate the optical sensing circuitry to its optimum levels. This procedure can be done while the unit is in the Host machine or on the workbench with the appropriate 12-volt or 24-volt power source.

6.3.1.1 Scope

This procedure is applicable to all Falcon Currency Validators and must be performed under the following conditions:

1. **At final shop test of the machine, prior to public deployment**
2. **After preventive or corrective maintenance**
3. **Whenever bank note acceptance is degraded.**

6.3.1.2 Required Items

The items required to perform the VLA are:

- Applicable Program Specification Sheet

CAUTIONS:

1. DO NOT perform VLA under adverse environmental conditions. The VLA should only be performed at temperatures between 0 to 60°C with a non-condensing humidity of 0 to 95 percent.
2. DO NOT use the wrong VLA card while doing a VLA. ONLY USE an approved VLA card as indicated in your program Specification Sheet. The use of the wrong VLA card can result in impaired Currency Validator performance.
2. DO NOT use soiled or physically damaged (e.g., creased, perforated, bent, etc.) VLA cards while doing a VLA. The quality of the VLA card will affect the quality of the adjustment. When not in use, the card should be placed in an envelope and stored in a cool, dry environment. Should the card become damaged, replace it with a new one.

- VLA Card for 70-mm wide channel (*GPT* PN 300EO005)
- Small DIP-Switch manipulator (e.g., a small, non-metallic, non-conductive stick-like item such as a toothpick or plastic tweezers).

6.3.1.3 VLA Procedure

To perform the VLA, follow these steps:

1. Power down Currency Validator.
2. Set DIP-Switches 7 and 8 to the **on** position (i.e., toward number), and DIP-Switch 6 to the **off** position. The DIP-switch settings for all service mode functions are shown in **Table 6-1**.

DIP Switch Settings – VLA Service Mode

Figure 6-2. 8-Pack DIP-Switches

Table 6-1. DIP Switch Settings – Service Mode

DIP Switch Settings	Function
6, 7, 8 = on	Download Mode Enabled
7 and 8 = on 6 = off	VLA Mode Enabled
7 = off 1 to 6, 8 = on	Clear setup
6 and 7 = off 1 to 5, 8 = on	Clear statistical buffer
5 and 7 = off 1 to 4, 6, 8 = on	ccTalk: reset encryption key to 123456

3. Power up Currency Validator.

CAUTION: DO NOT use cut, torn, creased, folded or perforated VLA cards for this test. Such damaged cards should be discarded and replaced with new cards.

4. Insert VLA Card.

The VLA Card will be drawn into the Currency Validator. The red LED will stop flashing and will remain lit. After 20 to 25 seconds, the VLA Card will be ejected from the Currency Validator; this indicates the end of the adjustment cycle. The red LED will resume flashing, and the unit will return to VLA mode.

Note: The VLA Card should be stored on a flat surface to prevent damage (e.g., creases and folds) to the card.

5. When VLA Card is ejected from unit, power down Currency Validator.
6. Set DIP-Switches 7 and 8 to the **off** (up) position, then set other switches as specified by the applicable Program Specification Sheet for your software configuration.

6.3.1.4 Description of VLA Process

Between power up and the start of the flashing red LED, the Side-Looking Sensors™ and the front and rear sensors are adjusted for optimal performance; this action takes less than 1-second. When the VLA Card is pulled into the validator, the Main Optical Sensors are adjusted. The validator uses the VLA Card to adjust all necessary settings to be within an acceptable range, and then stores the settings in non-volatile memory.

6.3.2 Functional Test

The Functional Test is performed to ensure that the Currency Validator is operational and can accept bills.

For this test, select two bills representative of those in circulation (i.e., non-mint quality), for each denomination supported by the program. To pass this test, the Currency Validator should accept both bills within three insertion attempts.

6.3.2.1 Procedure

1. Obtain two bills, of each denomination, supported by the program.
2. Starting with the lowest denomination, insert the bills one after another, in a single direction.
3. If unit fails this test, call for service; otherwise, perform the Service Acceptance Test (**Subsection 6.3.3**).

6.3.3 Service Acceptance Test

When the Service Acceptance Test (SAT) is performed, the service technician can determine if the Currency Validator is operating at a satisfactory bill acceptance rate. For this test, the following criteria are used:

- Eight bills of currency representative of the *in circulation quality* (i.e., non-mint), of each denomination supported by the program will be used.
- Bills will be arranged so that their orientation is the same throughout each group of insertions.
- For the first group of inserted bills, bills will be inserted once, one at a time, in a single direction.
- The test will be repeated for each of the other denominations and directions supported by the program.
- If more than two bills, of any denomination, are rejected regardless of insertion direction, then the Currency Validator fails this test.

6.3.3.1 Required Items

The items required to perform the Service Acceptance Test are:

1. Program Specification Sheet
2. Applicable currency accepted by the program (refer to **Currency** section of the Program Specification Sheet)
3. 24-V Power Supply Kit, *GPT* PN 350K0004G, or
   12-V Power Supply Kit, *GPT* PN 350K0005G
4. RS-232 Extension Cable Harness *GPT* PN 350EX003
5. V2e Host Controller Installation Disk (latest version[9]), *GPT* 45011.
6. **Video-Level Adjustment** procedure (optional).

6.3.3.2 Procedure

To test the bill acceptance rate of the Currency Validator, follow these steps:

WARNINGS:

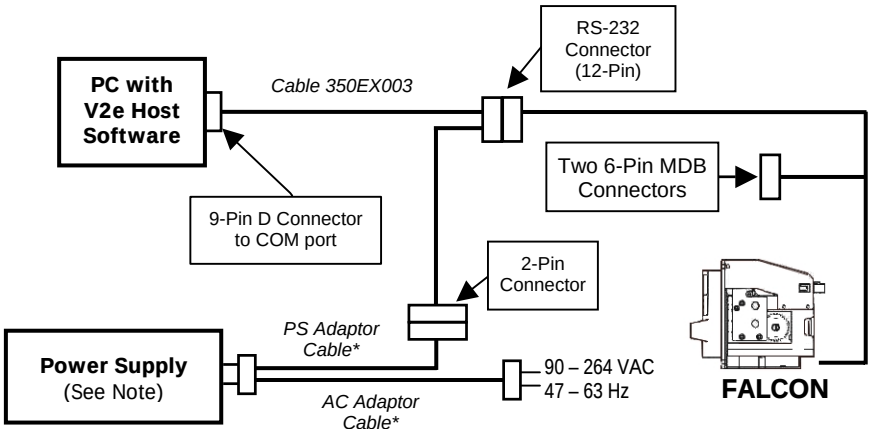
1. PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE CURRENCY VALIDATOR MAY RESULT BY APPLYING INCORRECT VOLTAGE TO THE CURRENCY VALIDATOR. ONLY APPLY VOLTAGE AS SPECIFIED ON THE CE/WARNING LABEL FOUND ON THE BOTTOM OF THE CURRENCY VALIDATOR.
2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CONNECT POWER TO THE CURRENCY VALIDATOR IN A DAMP OR WET ENVIRONMENT.
3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CONNECTING OR DISCONNECTING POWER TO CURRENCY VALIDATOR.

Note: To optimize the optical sensing circuitry, perform the Video-Level Adjustment (refer to Subsection 6.3.1) prior to this test. However, DO NOT perform the Video-Level Adjustment if you are testing Falcon to determine its *as-is* condition.

1. Using the required cables, connect the Currency Validator and Stacker to the Power Supply and PC (see **Figure 6-3**).

Note: For information about using the V2e Host Controller Application Software, refer to *V2e Host Controller Application User Guide,* Pub. No. G9S6120.

[9] For use with unit's configured with V2.2 Standard/Extended or MDB protocols.



Note: Refer to *GPT* Power Supply Kit Part Numbers below:

1. For 12-Volt units: use *GPT* PN 350K0005G (*cables included in kit)
2. For 24-Volt units: use *GPT* PN 350K0004G (*cables included in kit)

Figure 6-3. SAT Setup Diagram

CAUTION: DO NOT use cut, torn, or perforated bills for this test. Such damaged bills may be legal tender in circulation, but would cause false test failures.

2. Obtain eight bills representative of the *in-circulation quality* (i.e., non-mint), of each denomination supported by the program.
3. Starting with the lowest denomination, insert the bills one after another.

Notes:

1. Insert the first group of bills once, one at a time, in a single direction. If more than two bills are rejected, obtain another set of bills, then repeat this test.
2. If more than two bills are rejected for the second set of bills, discontinue this test, and then perform Diagnostics in Chapter 5.

4. Repeat Steps 2 and 3 for all directions and denominations supported by the program.

6.4 Supplemental Service Procedures

The following procedures are supplementary in nature and have been included in the latest issue of ***V2e Host Controller Application User Guide***, Publication Number, **G9S6120**. Using *GPT* 's V2e Host Controller Application software, which is a Windows®-based PC application, the user can easily connect to the Currency Validator and perform the Program Download and Memory Clear procedures. To obtain a copy of this document, contact *GPT* Customer Service.

6.4.1 Program Download Procedure

Program downloading is required when the unit's application program and/or database files need to be upgraded. Typically, this occurs when a new currency denomination is added or when an improvement is made to the application program.

To perform the Program Download Procedure, refer to **Chapter 5, *Serial Downloader*** of ***V2e Host Controller Application User Guide***.

6.4.2 Memory Clear Procedure

The memory clear procedure allows the service technician to erase current setup options and restore the unit's power-up settings. The setup options include the following functions: select bank note orientation, select stacker required/not required option, disable Inhibit State, and select system mode (polling/interrupt; escrow on/off).

This procedure is not regularly performed on Falcon but is recommended only as the maintenance situation may require. This procedure should be performed when:

- Any PCB is changed
- The program is changed
- Falcon does not accept bills or has a poor bill acceptance rate
- Falcon is operating abnormally.

To perform the Memory Clear Procedure, refer to **Chapter 4, *Starting and Running V2e Host Controller Application*** of ***V2e Host Controller Application User Guide***.

6.4.3 Stacker Maintenance

Under normal use, the Stacker requires very little maintenance. Occasionally, however, when the Stacker is empty during transportation, the Pressure Plate may become dislocated from its normal operating position. To fix this problem, relocate the tabs of the Pressure Plate into the cutout guides on the inside of the case. For other symptoms, refer to **Table 5-3**. For locations of internal components, see **Figure 6-4**.

Note: Internal components of the 400-Bill and the 200-Bill Stackers are identical. Therefore, only components of the 400-Bill Stacker are shown below.

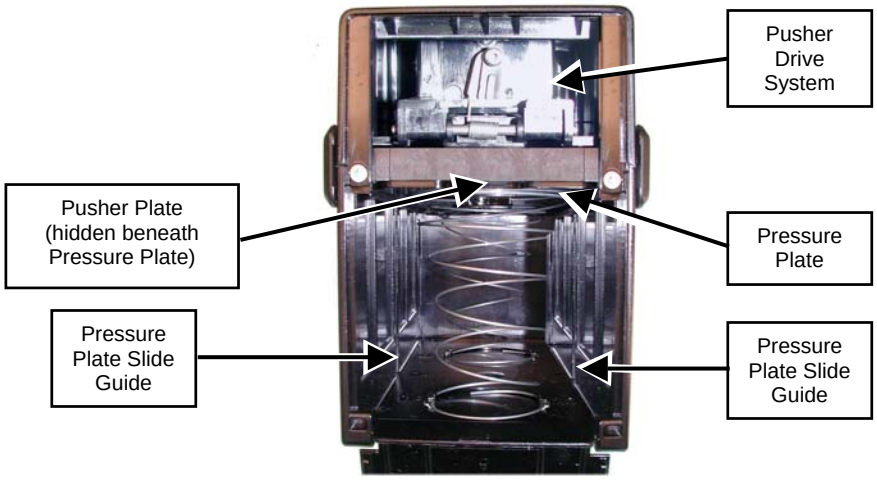


Figure 6-4. Stacker – Internal Parts

This page left intentionally blank.

CHAPTER 7 – CORRECTIVE MAINTENANCE

This Chapter Covers:

1. GENERAL INFORMATION
2. DEFLECTOR PLATE, BEZEL & SUPPORT BRACKET REMOVAL AND REPLACEMENT
3. LOWER-GUIDE ASSEMBLY BREAKDOWN
4. UPPER-GUIDE ASSEMBLY BREAKDOWN

7.1 General Information

Prior to corrective maintenance, the user should perform Diagnostics (refer to **Chapter 5**) and Calibration/Bench Testing (refer to **Chapter 6**) to determine the faulty part. Corrective maintenance for Falcon includes:

- Separation of major assemblies and subassemblies
- Removal and replacement of associated parts.

WARNINGS:

1. AVOID PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE VALIDATOR. DISCONNECT POWER SUPPLY BEFORE CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CLEAN OR REPAIR VALIDATOR IN A DAMP OR WET ENVIRONMENT.

3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

CAUTION: DO NOT allow Electrostatic Discharge (ESD) to damage the validator's electronic components; follow all industry-accepted ESD-prevention procedures when replacing components.

Note: When calling *GPT* for assistance (refer to Contact Information at the back of this manual), please have the following information available so that a Customer Service representative can quickly assist you:

1. The Serial Number of your Currency Validator
2. Part Number of your Currency Validator
3. Program Number of your Currency Validator
4. Troubleshooting codes.

7.1.1 Major Assembly Cross-Reference Matrix

The level of breakdown for the removal and re-assembly of all parts within the Upper- and Lower-Guide Assemblies are referenced in the matrix (refer to **Table 7-1**). Other parts that are attached to these assemblies (e.g., bezels, Stacker support brackets, Stackers) are also referenced in the matrix.

Table 7-1. Falcon Currency Validator Part Breakdown Matrix

Assemblies to be Replaced	Instructions to follow… *For removal and replacement, refer to…*
Stacker/Deflector Plate for Model G3V Units	Subsection 7.2.2
Bezel Assembly for Model G3V Units	Subsection 7.2.3
Support Bracket for Model G3V Units	Subsection 7.2.4
Bezel Assembly for Model FL4 Units	Subsection 7.2.5
Support Bracket for Model FL4 Units	Subsection 7.2.6
Bezel Assembly for Model FL6 Units	Subsection 7.2.7
Support Bracket for Model FL6 Units	Subsection 7.2.8
Lower-Guide Assembly	Section 7.3
Lower-Guide Housing Assembly	Subsection 7.3.2
Lower-Guide Optics Assembly	Subsection 7.3.2.1
Stepper Motor & Motor Bracket	Subsection 7.3.2.2
Pressure Rollers	Subsection 7.3.2.3
Idler Wheels, Shaft-Lock Housing, and Idler Spring	Subsection 7.3.2.4
Lever Latch	Subsection 7.3.2.5
Lower-Guide Optics Assembly	Subsection 7.3.3
Main Assembly	Subsection 7.3.3.1
Regulator Assembly	Subsection 7.3.3.2
Bar Code Reader PCB Assembly	Subsection 7.3.3.3
Upper-Guide Assembly	Section 7.4
Upper-Guide Housing Assembly	Subsection 7.4.2
Upper-Guide Optics Assembly	Subsection 7.4.2.1
Idler/Drive Gears, Axles, and Timing Belt	Subsection 7.4.2.2
Latch Spring	Subsection 7.4.2.3
Rear Sensor Prism & SLS Optical Lenses	Subsection 7.4.2.4
Upper-Guide Optics Assembly	Subsection 7.4.3
Upper-Guide Array Assembly	Subsection 7.4.3.1
Upper-Guide PCB Assembly	Subsection 7.4.3.2
Lower-to-Upper Guide Cable Assembly	Subsection 7.4.3.3
Stacker Connector Cable Assembly	Subsection 7.4.3.4
Bezel Cable Assembly	Subsection 7.4.3.5

7.2 Deflector Plate, Bezel & Support Bracket Removal and Replacement

This section provides instructions to replace the Deflector Plate, Bezel Assembly, and Support Bracket for Falcon's Models G3V, FL-4, and FL-6. The Currency Validator must be removed from the Host machine to allow access to these parts. In addition, the Stacker should be separated from the validator.

7.2.1 Required Tools

The following tools are required to remove the Bezel or the Deflector Plate:

- Screwdriver, No. 1 Phillips-head
- Screwdriver, standard slot-head
- Pliers, 5-inch needle nose

The following tools are required to remove the Support Bracket only:

- Hex key wrench: 2-mm (5/16-inch)
- Spacer gauge for 78.5-mm channel width (*GPT* PN 350B0374).

7.2.2 Stacker/Deflector Plate Replacement Procedure for Model G3V Units

Instructions to detach the Stacker and the Deflector Plate, if used, from the Model G3V are in this section. The Deflector Plate is used for down-stack units only. To detach the Stacker or the Deflector Plate, follow these steps:

Note: To detach the Deflector Plate, proceed to Step 4.

1. Place unit in up-right position (see **Figure 7-1**).

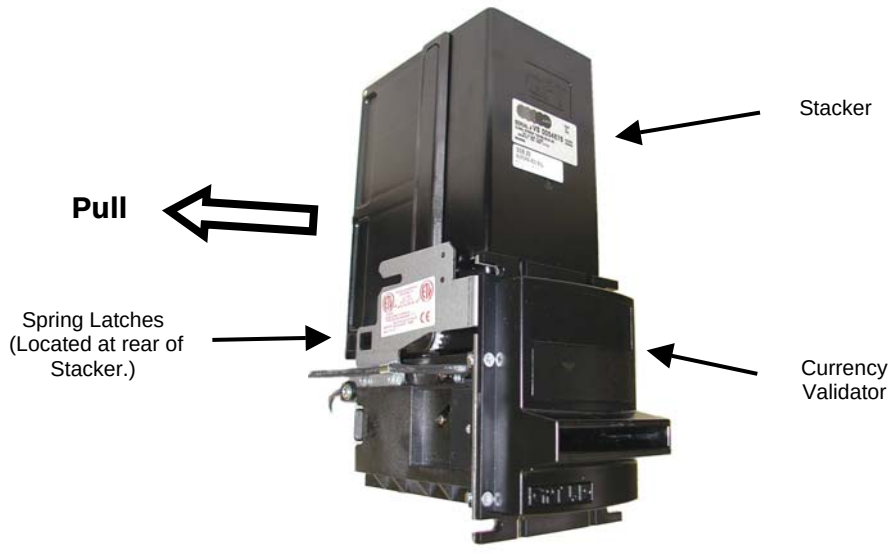


Figure 7-1. Falcon Model G3V with Stacker in Up-Right Position

2. Locate spring latches at rear of Stacker.
3. While squeezing spring latches with thumb and middle finger, carefully pull Stacker away from bezel, and then remove Cash Box.

Note: For instructions to remove and replace the deflector plate and its associated parts, refer to *Expeller Kit for Falcon and Aurora G3V Units*, document number G3A7179.

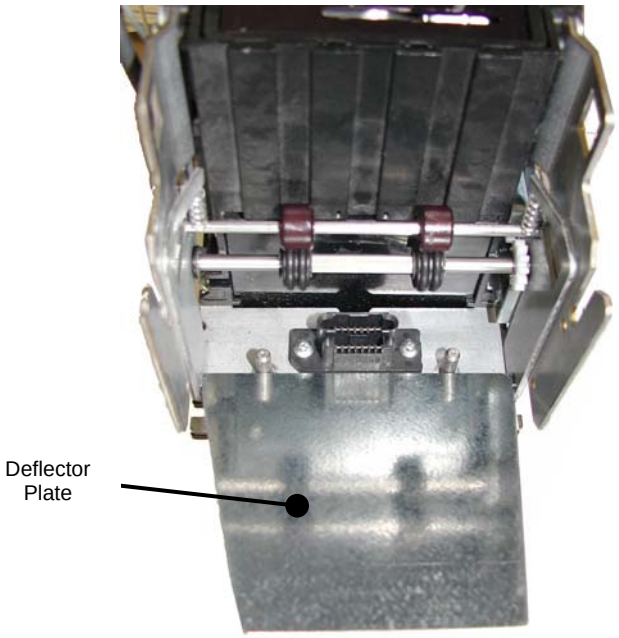


Figure 7-2. Falcon Model G3V with Deflector Plate – Used on Down-Stack Units Only

4. Install a Stacker to Currency Validator. Ensure that spring latches on Stacker are fully engaged into recessed holes of Support Bracket.

7.2.3 Bezel Assembly Replacement Procedure for Model G3V

Instructions to replace the Bezel Assembly for Model G3V units are in this section. To replace the Bezel Assembly, follow these steps:

Notes:

1. Retain hardware (e.g., screws, nuts) when removing the Bezel Assembly; hardware can be reused when the Bezel Assembly is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-2.

1. Remove four screws (2) and nuts (3) holding Bezel Assembly (1) to Support Bracket (4) (see **Figure 7-3**).
2. Disconnect connector of Bezel Cable Assembly from connector of Simple Bezel PCB Assembly (1b).
3. Remove Bezel Assembly (1) from validator head.

Note: To install a new Bezel Assembly, proceed to Step 4.

4. Attach connector of Bezel Cable Assembly to connector of Simple Bezel PCB Assembly (1b).
5. Align new Bezel Assembly (1) to front face of Support Bracket (4).
6. Place a nut (3) behind Support Bracket (4) and align it with a screw hole.
7. Insert and tighten screw (2); repeat for other three screws and nuts.

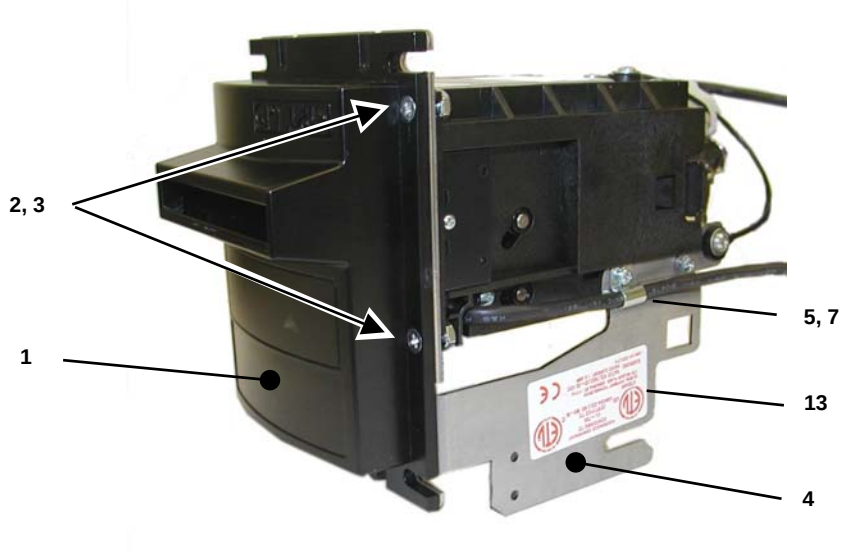


Figure 7-3. Bezel Assembly & Support Bracket Hardware for Model G3V (Sheet 1 of 2)

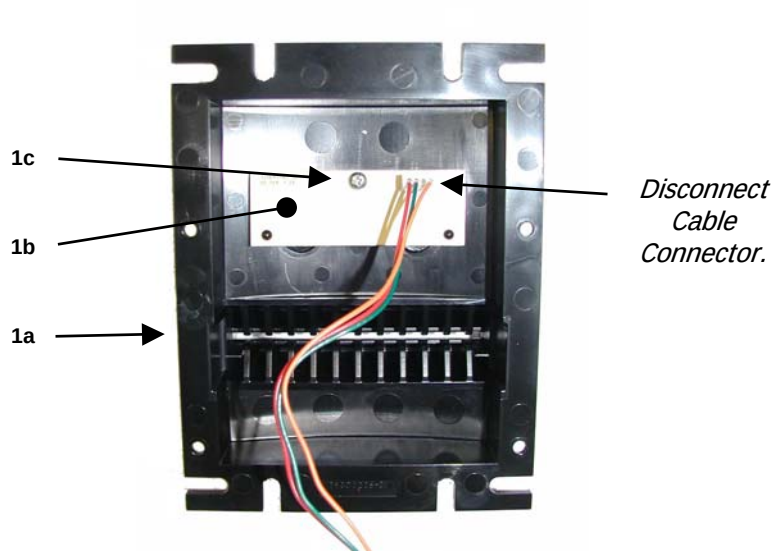


Figure 7-3. Bezel Assembly & Support Bracket Hardware for Model G3V (Sheet 2 of 2)

Table 7-2. Bezel Assembly & Support Bracket Hardware Parts List for Model G3V

(For part locations, refer to **Figures 7-3**, **7-4**, and **7-5**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0008-01	Assembly, Bezel, Model G3V; this item is used on PNs 325GXXX1XXXXG and 327GXXX1XXXXG (where X can be any digit from 1 to 9); includes:	1
1a	350D0206-01	Bezel, G3V	1
1b	325EA008G-01	PCB Assembly, G3V, Falcon, Simple Bezel, LF	1
1c	355A0039	Screw, TFORM Plastite, PPH (#4 x 3/16-inch), LF	1
1d	325EC005G	Label, Graphics Bezel	1
2	352-0632-0138	Screw, Phillips Flat-Head, 100º (#6-32 x ½-inch), Lead Free (LF)	4
3	306-0001-0632	Nut, Hex, KEPS #6-32, Steel, LF	4
4	350C0294	Bracket, Support Validator/Stacker, G3V	1
5	352-4250-0117	Screw, Phillips Pan-Head (#4-40 x 1/4-inch), LF	5
6	352-0440-0157	Screw, PPH, SEMS (#4-40 x 5/16-inch), LF	1
7	350B0276	Cable Clamp	1
8	300B0508	Lanyard, Plastic, 6-inch, LF	1
9	352-0440-0168	Screw, Truss-Head (#4-40 x 3/16-inch), LF	4
10	390-0632-0001	Washer, Flat, #6, Steel, LF	2
11	325D0012	Bracket, Lanyard	1
12	350EC004G	Assembly, Cable, SRC with Draw Connector	1
13	300EL037G, or	Label, Compliance, 12 V, LF	1
	300EL014G	Label, Compliance, 24 V, LF	1

7.2.4 Support Bracket Replacement Procedure for Model G3V

Instructions to replace the Support Bracket, which is used to mount the Stacker to the Currency Validator, for Model G3V units are in this section.

To replace the Support Bracket, follow these steps:

Notes:

1. Retain hardware when removing the Support Bracket; hardware can be reused when the bracket is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-2.

1. Remove four screws (2) and nuts (3) holding Bezel Assembly (1) to Support Bracket (4) (see **Figure 7-3**).
2. Disconnect connector of Bezel Cable Assembly from connector of Simple Bezel PCB Assembly.
3. Remove Bezel Assembly (1) from validator head.
4. Remove two screws (5), and two screws (5) with lanyard bracket (11) and cable clamp (7) from Support Bracket (see **Figures 7-3** and **7-4**).
5. Remove two screws (9) that hold connector of Stacker Cable Assembly (12) to Support Bracket (see **Figure 7-5**).

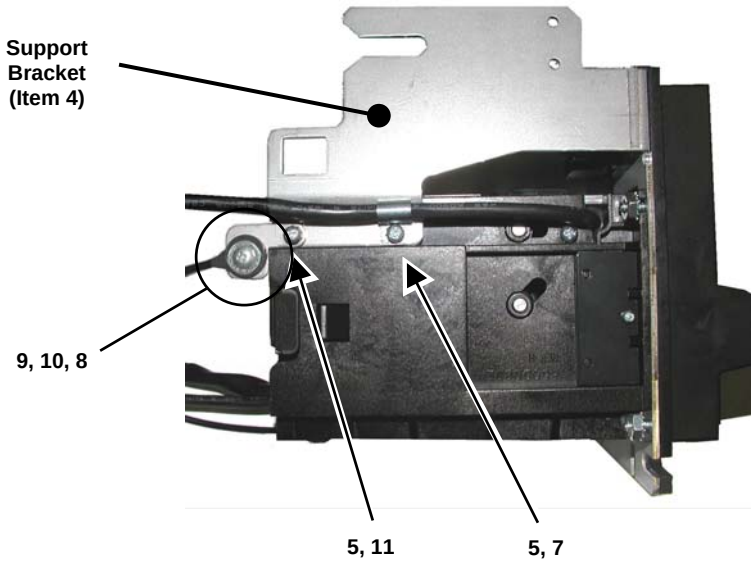


Figure 7-4. Support Bracket Hardware for Model G3V

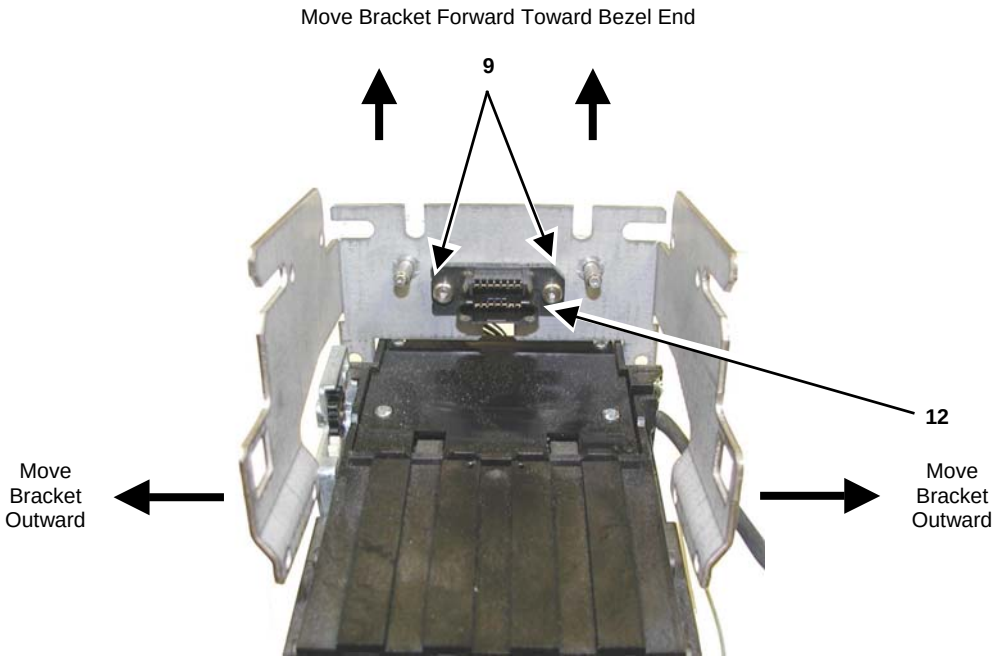


Figure 7-5. Separation of Support Bracket for Model G3V

6. Remove Support Bracket – simultaneously pull each side of bracket outward slightly, and then carefully slide bracket toward bezel end past Stacker Connector (see **Figure 7-5**).

Note: To install a new Support Bracket, proceed to Step 7.

7. Position the connector of the Stacker Cable Assembly (12) through the slot in the Support Bracket (4) and then carefully slide the bracket towards the rear of the validator (see **Figure 7-6**).

CAUTION: DO NOT allow the wires of the Stacker Cable Assembly to catch between the validator and the Support Bracket. Operation of the validator will be impaired if the wires are damaged.

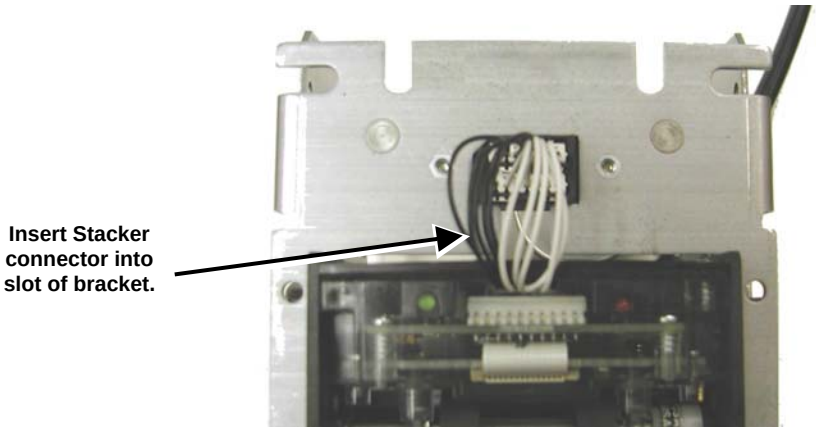


Figure 7-6. Installation of Support Bracket for Model G3V

8. Using two screws (9), secure the connector of Stacker Cable Assembly (12) to Support Bracket (see **Figure 7-5**); when installed properly, the connector should not be locked in place but should float freely on the Support Bracket.
9. Partially slide the Lower-Guide Assembly outward, and then place the spacer gauge across the channel guide (see **Figure 7-7**).

CAUTION: DO NOT attach the Bezel Assembly unless the spacer gauge is installed in the channel guide. Operation of the validator will be impaired if the Bezel Assembly is not properly installed.

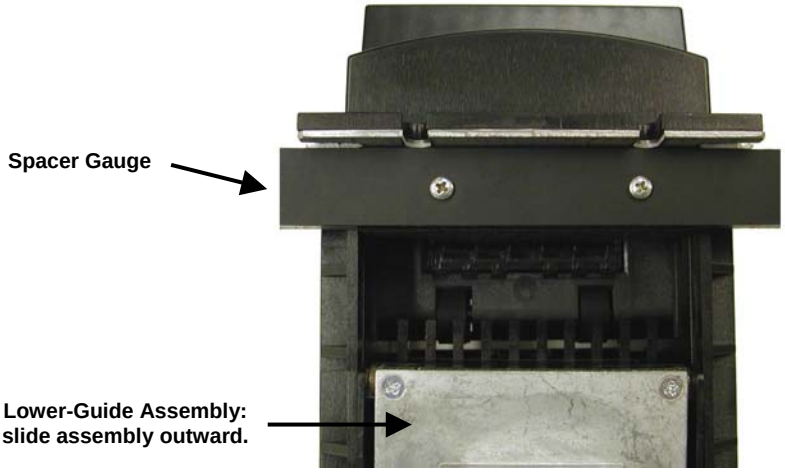


Figure 7-7. Installation of Spacer Gauge for Model G3V

10. Using four screws (2) and nuts (3), install and secure Bezel Assembly (1) to validator (see **Figure 7-3**).
11. Secure Support Bracket to validator as follows:
    a. Attach Lower-to-Upper Guide Cable Assembly with cable clamp (7) and screw (5) to Support Bracket (see **Figure 7-4**).
    b. Attach Lanyard Bracket (11) with screw (5) to Support Bracket.
    c. Install two screws (5) to Support Bracket (see **Figure 7-3**).
    d. Tighten all screws to a torque setting of 4.7 inch-pounds.
12. Remove spacer gauge and slide Lower-Guide Assembly into place. Ensure that Lower-Guide Assembly slides easily in the channel. If not, loosen Support Bracket screws and repeat **Steps 9** through **11**.
13. Attach a Stacker, with guide pins, to Currency Validator. Check that spring latches on Stacker are fully engaged into recessed holes of Support Bracket.
14. Attach appropriate **CE/WARNING** label to Support Bracket. Ensure voltage on new label matches voltage on old label.

CAUTION: DO NOT attach the wrong label to the Support Bracket. Operation of the validator will be impaired if the incorrect voltage is applied to the unit.

7.2.5 Bezel Assembly Replacement Procedure for Model FL-4 Units

Instructions to replace the Bezel Assembly for Model FL-4 units are in this section. To replace the Bezel Assembly, follow these steps:

Notes:

1. Retain hardware when removing the Bezel Assembly; hardware can be reused when the Bezel Assembly is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-3.

1. Remove four screws (2) and nuts (3) holding Bezel Assembly (1) to Support Bracket (4); support Bezel Assembly to avoid damage to Bezel Cable Assembly (see **Figure 7-8**).
2. Remove screw (1f) holding Bezel Cover (1d) to Bezel; disconnect connector of Bezel Cable Assembly from connector of Animated Bezel PCB Assembly (1b); remove Bezel Assembly (1).

Note: To install a new Bezel Assembly, proceed to Step 3.

3. Attach connector of Bezel Cable Assembly to connector of Animated Bezel PCB Assembly (1b).
4. Align new Bezel Assembly (1) to Support Bracket (4) and validator head.
5. Place a nut (3) behind Support Bracket (4) and align it with a screw hole.
6. Insert and tighten screw (2); repeat for other three screws and nuts.

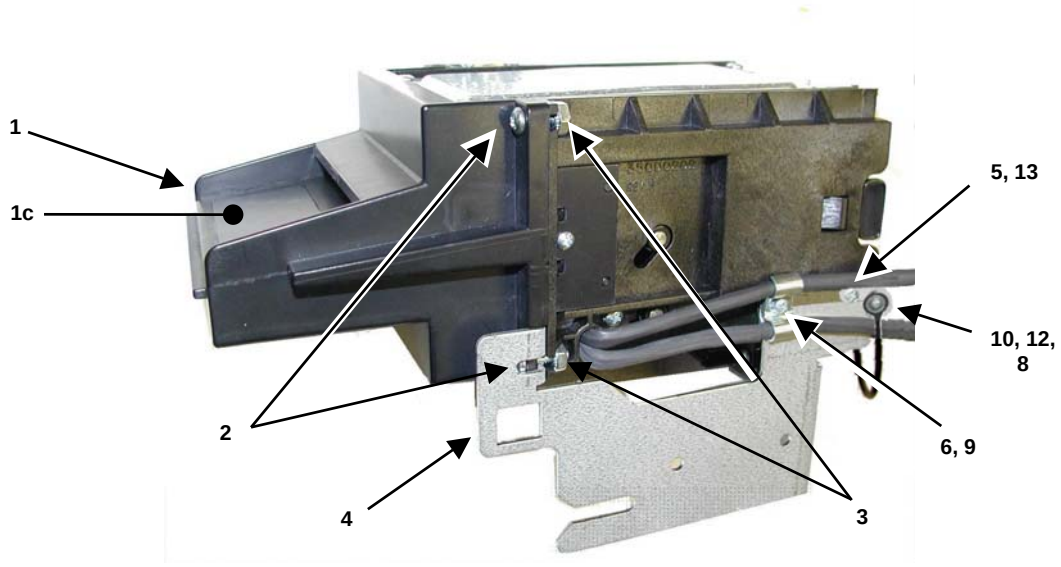


Figure 7-8. Bezel Assembly & Support Bracket Hardware for Model FL-4 (Sheet 1 of 2)

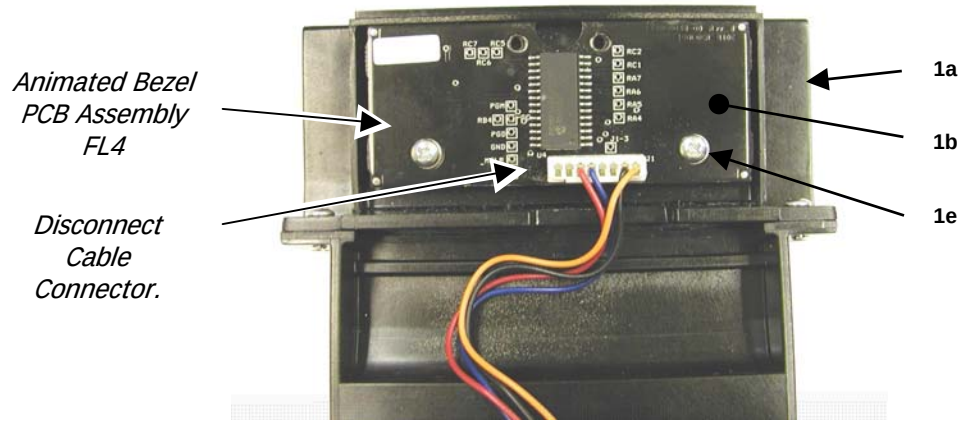


Figure 7-8. Bezel Assembly & Support Bracket Hardware for Model FL-4 (Sheet 2 of 2)

Table 7-3. Bezel Assembly & Support Bracket Parts List for Model FL-4

(For part locations, refer to **Figures 7-8**, **7-9**, and **7-10**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	351D0012-1	Assembly, Bezel, FL4; this item is used on PN 328GXXX01XXXG (where X can be any digit from 1 to 9); includes:	1
1a	351D0005	Bezel, FL-4	1
1b	350EA038G-01	Assembly, PCB, FL-4, Animated Bezel, Lead Free (LF)	1
1c	300C0115	Decal, Bezel Graphics	1
1d	351C0006	Cover, Bezel, FL-4	1
1e	300A0711	Screw, Thread Rolling, PPH (#4 x 1/4-inch), LF	2
1f	352-8250-0135	Screw, Phillips Flat-Head 100º (#4-40 x 1/4-inch) LF	1
2	352-0632-0146	Screw, Phillips Pan-Head (#6-32 x 1/2-inch)	4
3	306-0001-0632	Nut, Hex, KEPS #6-32, Steel, LF	4
4	351D0004	Assembly, Support Bracket, FL4	1
5	352-4250-0117	Screw, Phillips Pan-Head (#4-40 x 1/4-inch), LF	5
6	352-0440-0157	Screw, Phillips Pan-Head SEMS (#4-40 x 5/16-inch) LF	2
7	352-8250-0135	Screw, Phillips Flat Head 100º (#4-40 x 1/4-inch), LF	2
8	350B0276	Cable Clamp	2
9	300B0508	Lanyard, Plastic, 6-inch, LF	1
10	352-0440-0168	Screw, Truss-Head (#4-40 x 3/16-inch), LF	4
11	350EC021G	Assembly, Cable, SRC with Draw Connector	1
12	390-0632-0001	Washer, Flat, #6, Steel, LF	2
13	325D0012	Bracket, Lanyard	1
14	300EL037G, or	Label, Compliance, 12 V, LF	1
	300EL014G	Label, Compliance, 24 V, LF	

7.2.6 Support Bracket Replacement Procedure for Model FL-4 Units

Instructions to replace the Support Bracket, which is used to mount the Stacker to the Currency Validator for Model FL-4 units, are in this section.

To replace the Support Bracket, follow these steps:

Notes:

1. Retain hardware when removing the Support Bracket; hardware can be reused when the bracket is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-3.

1. Remove two bottom screws (2) and nuts (3) holding Support Bracket (4) to Bezel Assembly (1) (see **Figure 7-7**).
2. Remove the following items:
   a. Two screws (7) (see **Figure 7-9**).
   b. Two screws (5) (see **Figure 7-9**).
   c. One screw (6) with two cable clamps (see **Figure 7-8**).
   d. One screw (5) with lanyard bracket (13) (see **Figure 7-8**).

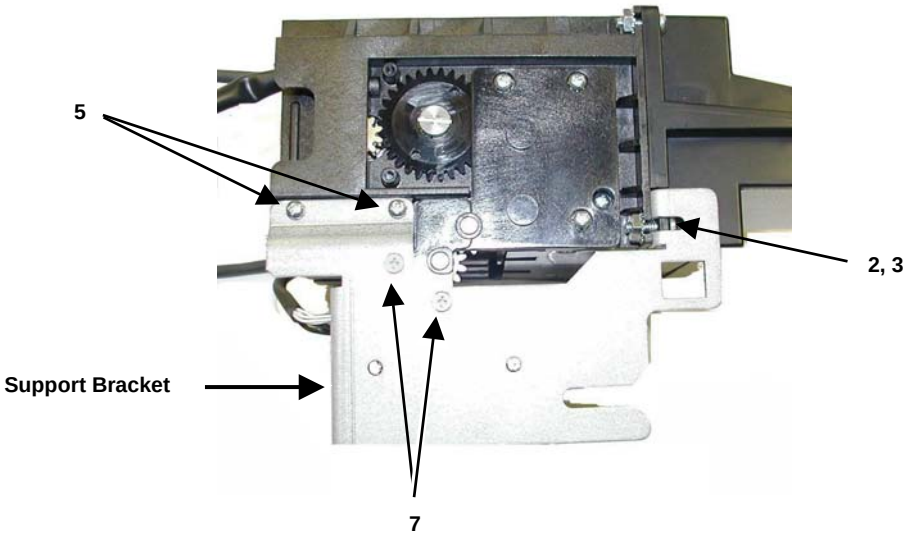


Figure 7-9. Support Bracket Hardware for Model FL-4

3. Remove two screws (10) that hold connector of Stacker Cable Assembly (11) to Support Bracket (see **Figure 7-10**).

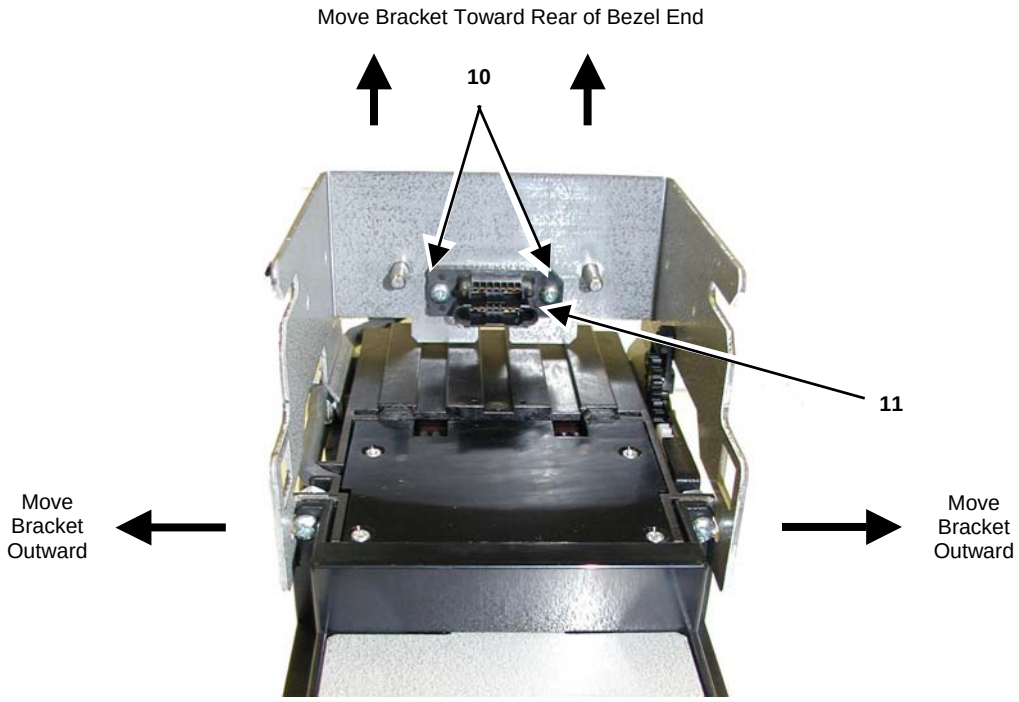


Figure 7-10. Separation of Support Bracket for Model FL-4

4. Remove Support Bracket – simultaneously pull each side of bracket outward slightly, and then carefully lower bracket from unit; carefully disengage Stacker Connector from bracket (see **Figure 7-10**).

Note: To install a new Support Bracket, proceed to Step 5.

5. Position connector of Stacker Cable Assembly (11) through slot in Support Bracket (4) and then carefully slide bracket towards rear of validator (see **Figure 7-11**).

CAUTION: DO NOT allow the wires of the Stacker Cable Assembly to catch between the validator and the Support Bracket. Operation of the validator will be impaired if the wires are damaged.

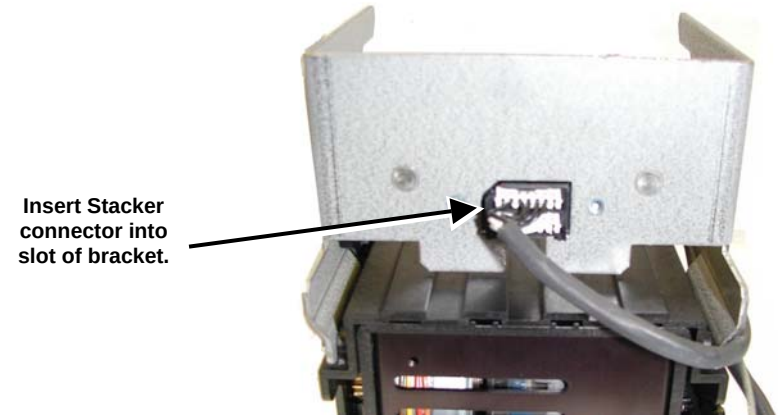


Figure 7-11. Installation of Support Bracket for Model FL-4

6. Using two screws (10), secure connector of Stacker Cable Assembly (11) to Support Bracket (see **Figure 7-10**); when installed properly, connector should not be locked in place but should float freely on Support Bracket.
7. Partially slide Lower-Guide Assembly outward, and then place spacer gauge across channel guide (see **Figure 7-12**).

CAUTION: DO NOT attach the Bezel Assembly unless the spacer gauge is installed in the channel guide. Operation of the validator will be impaired if the Bezel Assembly is not properly installed.

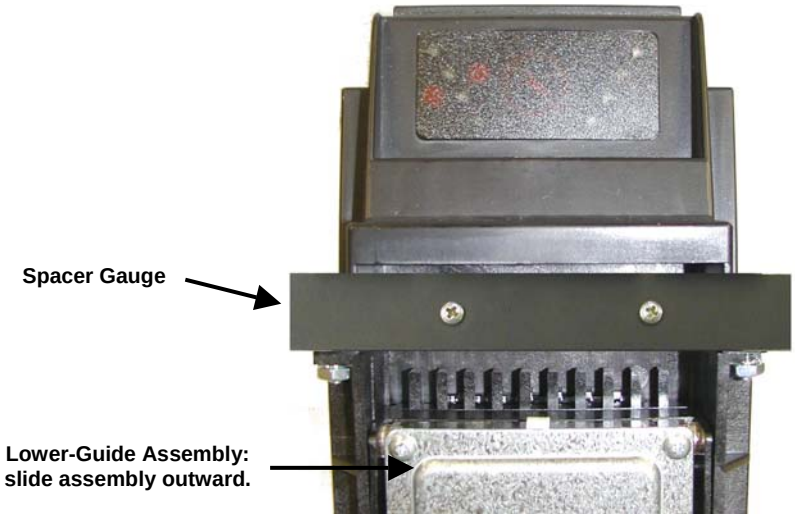


Figure 7-12. Installation of Spacer Gauge for Model FL-4

8. Install and secure Bezel Assembly (1) to validator with four screws (2) and nuts (3) (see **Figure 7-8**).
9. Secure Support Bracket to validator as follows:
   a. Install two screws (5) (see **Figure 7-9**); do not tighten screws at this time.
   b. Install two screws (7) (see **Figure 7-9**); do not tighten screws at this time.
   c. Install one screw (6) with two cable clamps (8) (see **Figure 7-8**); do not tighten screws at this time.
   d. Install lanyard bracket (13) with screw (5) (see **Figure 7-8**).
   e. Tighten all screws to a torque setting of 4.7 inch-pounds.
10. Remove spacer gauge and slide Lower-Guide Assembly into place. Ensure that Lower-Guide Assembly slides easily in the channel. If not, loosen Support Bracket screws and repeat **Steps 8** through **10**.
11. Attach a Stacker, with guide pins, to Currency Validator. Check that spring latches on Stacker are fully engaged into recessed holes of Support Bracket.
12. Attach appropriate **CE/WARNING** label to Support Bracket. Ensure voltage on new label matches voltage on old label.

CAUTION: DO NOT attach the wrong label to the Support Bracket. Operation of the validator will be impaired if the incorrect voltage is applied to the unit.

7.2.7 Bezel Assembly Replacement Procedure for Model FL-6 Units

Instructions to replace the Bezel Assembly for Model FL-6 units are in this section. To replace the Bezel Assembly, follow these steps:

Notes:

1. Retain hardware when removing the Bezel Assembly; hardware can be reused when the Bezel Assembly is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-4.

1. Remove four screws (3) and four nuts (5) holding Bezel Assembly (1) or (2) to Support Bracket (6); hold Bezel Assembly to avoid damage to Animated Bezel Cable Assembly (see **Figure 7-13**).
2. Disconnect connector of Animated Bezel Cable Assembly from connector of Animated Bezel PCB Assembly; remove Bezel Assembly.

Note: To install a new Bezel Assembly, proceed to Step 3.

3. Attach connector of Animated Bezel Cable Assembly to connector of Animated Bezel PCB Assembly.
4. Align new Bezel Assembly (1) or (2) to Support Bracket (6) and validator head.
5. Place a nut (4) behind Support Bracket (5) and align it with a screw hole.
6. Insert and tighten screw (3); repeat for other three screws and nuts.

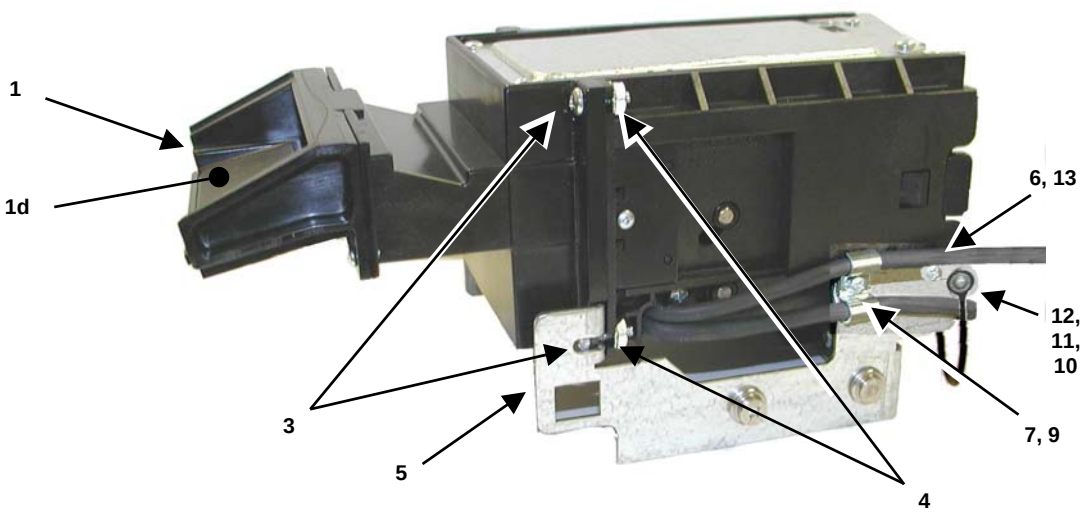


Figure 7-13. Bezel Assembly & Support Bracket Hardware for Model FL-6

Table 7-4. Bezel Assembly & Support Bracket Parts List for Model FL-6

(For part locations, refer to **Figures 7-13**, **7-14**, and **7-15**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	355D0018	Assembly, Bezel, FL6, Extension IDS; this item is used on PN 328GXXX05XXXG (where X can be any digit from 1 to 9); includes:	1
1a	355D0021	Bezel, IDS	1
1b	355D0020	Bezel, Interface	1
1c	350EA038G-01	Assembly, PCB, FL-4, Animated Bezel, Lead Free (LF)	1
1d	300C0115	Decal, Bezel Graphics	1
1e	355A0028	Screw, PPH, Tri-Lobular (#2 self-tapping), LF	2
1f	300A0711	Screw, Thread Rolling, PPH (#4 x 1/4-inch), LF	2
2	355D0017	Assembly, Bezel, FL6, Extension Cole (not shown); this item is used on PN 328GXXX04XXXG (where X can be any digit from 1 to 9); includes:	1
	355D0023	Bezel, Cole	1
	355D0020	Bezel, Interface	1
	350EA038G-01	PCB Assembly, FL-4, Animated Bezel, LF	1
	300A0711	Screw, Thread Rolling, PPH (#4 x 1/4-inch), LF	2
3	352-0632-0146	Screw, Phillips Pan Head, (#6-32 x 1/2-inch), LF	4
4	306-0001-0632	Nut, Hex, KEPS #6-32, Steel, LF	4
5	355D0008	Assembly, Support Bracket, FL6	1
6	352-4250-0117	Screw, Phillips Pan-Head (#4-40 x 1/4-inch), LF	5
7	352-0440-0157	Screw, Phillips Pan-Head SEMS (#4-40 x 5/16-inch), LF	1
8	352-8250-0135	Screw, Phillips Flat Head 100º (#4-40 x 1/4-inch), LF	2
9	350B0276	Cable Clamp	2
10	300B0508	Lanyard, Plastic, 6-inch, LF	1
11	390-0632-0001	Washer, Flat, #6, Steel, LF	2
12	352-0440-0168	Screw, Truss-Head (#4-40 x 3/16-inch), LF	4
13	325D0012	Bracket, Lanyard	1
14	350EC021G	Cable Assembly, SRC with Draw Connector, LF	1
15	300EL037G, or	Label, Compliance, 12 V, LF	1
	300EL014G	Label, Compliance, 24 V, LF	

7.2.8 Support Bracket Replacement Procedure for Model FL-6 Units

Instructions to replace the Support Bracket, which is used to mount the Stacker to the Currency Validator, for Model FL-6 units are in this section.

To replace the Support Bracket, follow these steps:

Notes:

1. Retain screws and nuts when removing the Support Bracket; this hardware can be used when the bracket is re-attached.
2. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-4.

1. Remove two bottom screws (3) and two nuts (4) holding Support Bracket (5) to Bezel Assembly (1) or (2) (see **Figure 7-14**).
2. Remove the following items:
   a. Two screws (8) (see **Figure 7-14**).
   b. Two screws (6) (see **Figure 7-14**).
   c. One screw (7) with two cable clamps (9) (see **Figure 7-13**).
   d. One screw (6) with lanyard bracket (13) (see **Figure 7-13**).

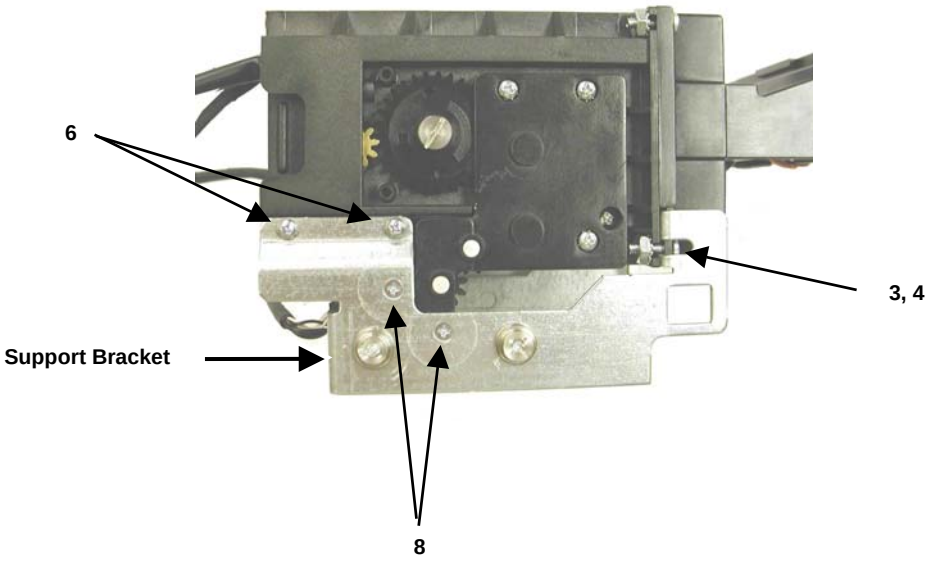


Figure 7-14. Support Bracket Hardware for Model FL-6

3. Remove two screws (12) that hold connector of Stacker Cable Assembly (14) to Support Bracket (see **Figure 7-15**).

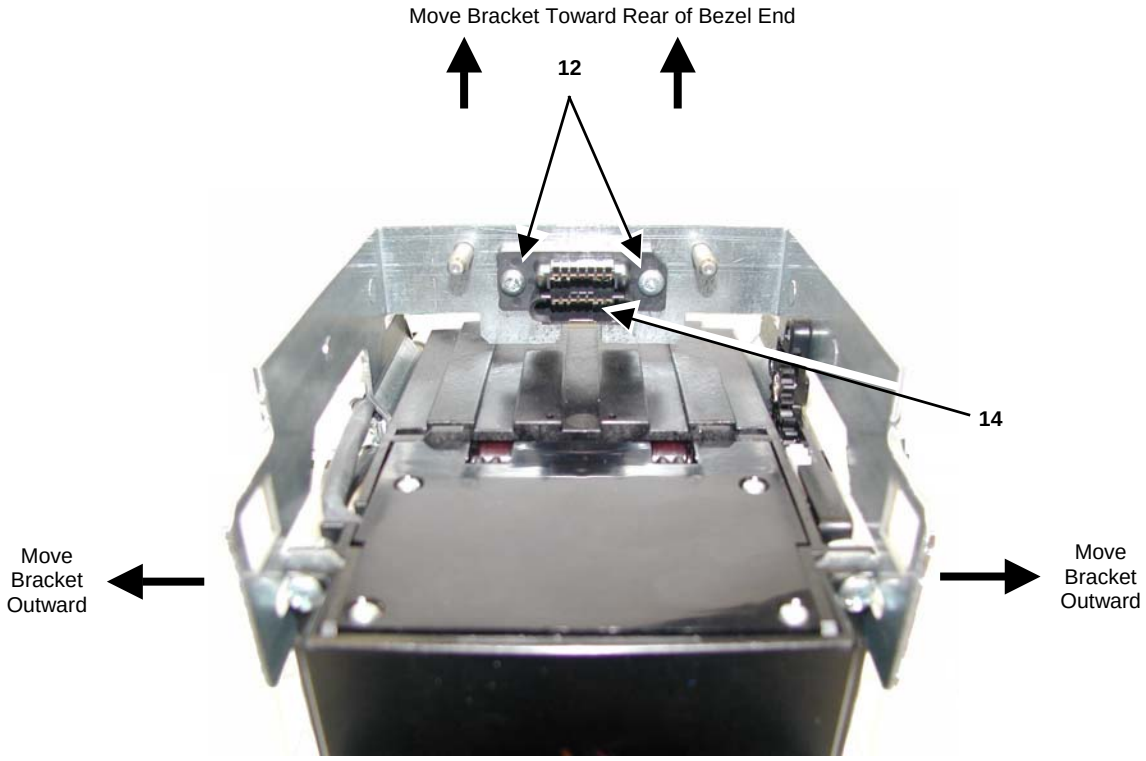


Figure 7-15. Separation of Support Bracket for Model FL-6

4. Remove Support Bracket – simultaneously pull each side of bracket outward slightly, and then carefully lower bracket from unit; carefully disengage Stacker Connector from bracket (see **Figure 7-15**).

Note: To install a new Support Bracket, proceed to Step 5.

5. Position connector of Stacker Cable Assembly (14) through slot in the Support Bracket (5) (see **Figure 7-16**).

CAUTION: DO NOT allow the wires of the Stacker Cable Assembly to catch between the validator and the Support Bracket. Operation of the validator will be impaired if the wires are damaged.

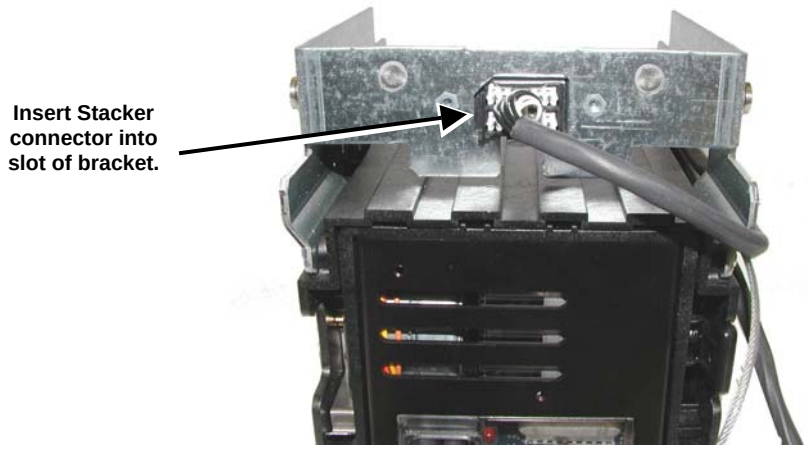


Figure 7-16. Installation of Support Bracket for Model FL-6

6. Using two screws (12), secure connector of Stacker Cable Assembly (14) to Support Bracket (see **Figure 7-15**); when installed properly, the connector should not be locked in place but should float freely on the Support Bracket.
7. Partially slide Lower-Guide Assembly outward, and then place spacer gauge across channel guide (see **Figure 7-17**).

CAUTION: DO NOT secure the Bezel Assembly to the Support Bracket unless the spacer gauge is installed in the channel guide. Operation of the validator will be impaired if the Bezel Assembly is not properly installed.

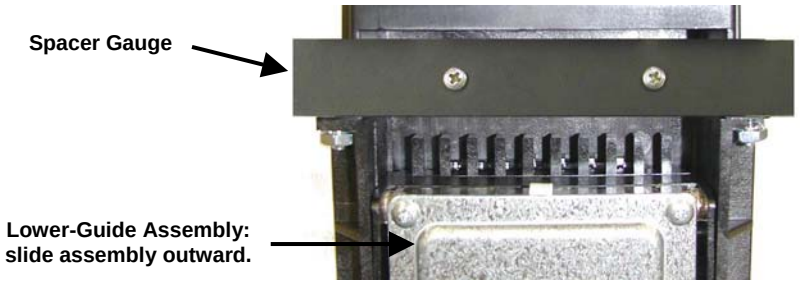


Figure 7-17. Installation of Spacer Gauge for Model FL-6

8. Install and secure Bezel Assembly (1) to validator with four screws (3) and four nuts (4) (see **Figure 7-13**).
9. Secure Support Bracket to validator as follows:
   a. Install two screws (8) (see **Figure 7-14**); do not tighten screws at this time.
   b. Install two screws (6) (see **Figure 7-14**); do not tighten screws at this time.
   c. Install one screw (7) with two cable clamps (9) (see **Figure 7-13**); do not tighten screws at this time.
   d. Install lanyard bracket (13) with screw (6) (see **Figure 7-13**).
   e. Tighten all screws to a torque setting of 4.7 inch-pounds.
10. Remove spacer gauge and slide Lower-Guide Assembly into place. Ensure that Lower-Guide Assembly slides easily in channel. If not, loosen Support Bracket screws and repeat **Steps 8** through **10**.
11. Attach a Stacker, with guide pins, to Currency Validator. Check that spring latches on Stacker are fully engaged into recessed holes of Support Bracket.
12. Attach appropriate **CE/WARNING** label to Support Bracket. Ensure voltage on new label matches voltage on old label.

CAUTION: DO NOT attach the wrong label to the Support Bracket. Operation of the validator will be impaired if the incorrect voltage is applied.

7.3 Lower-Guide Assembly Parts Breakdown

This section provides instructions to replace components of the Lower-Guide Assembly. Prior to performing this procedure, the Lower-Guide Assembly should be separated from the Upper-Guide Assembly.

The major assemblies of the Lower-Guide are:

- Lower-Guide Housing Assembly (refer to **Subsection 7.3.2**)
- Lower-Guide Optics Assembly (refer to **Subsection 7.3.3**).

7.3.1 Required Tools

The following tools are required:

- Screwdriver, No. 1 Phillips-head
- Pliers, 5-inch needle nose
- Retaining Clip Installation Tool (Rotor Clip, PN A120)
- Idler Spring Adjustment Tool (*GPT* PN 350B0557)

7.3.2 Lower-Guide Housing Assembly – Disassembly Procedure

This section provides instructions to disassemble the Lower-Guide Housing Assembly.

WARNINGS:

1. AVOID PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE VALIDATOR. DISCONNECT POWER SUPPLY BEFORE CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CLEAN OR REPAIR VALIDATOR IN A DAMP OR WET ENVIRONMENT.

3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

CAUTION: DO NOT allow Electrostatic Discharge (ESD) to damage the validator's electronic circuits; follow all industry-accepted ESD-prevention procedures when replacing components.

The parts of the Lower-Guide Housing Assembly, which can be replaced, are:

- Lower-Guide Optics Assembly (refer to **Subsection 7.3.2.1**)
- Stepper Motor Assembly and Motor Bracket (refer to **Subsection 7.3.2.2**)
- Pressure Rollers (refer to **Subsection 7.3.2.3**)
- Idler Wheels, Shaft-Lock Housing, and Idler Spring (refer to **Subsection 7.3.2.4**)
- Latch (refer to **Subsection 7.3.2.5**)

To replace the faulty part(s), proceed to the applicable subsection and perform the removal instructions.

7.3.2.1 Replacement of Lower-Guide Optics Assembly

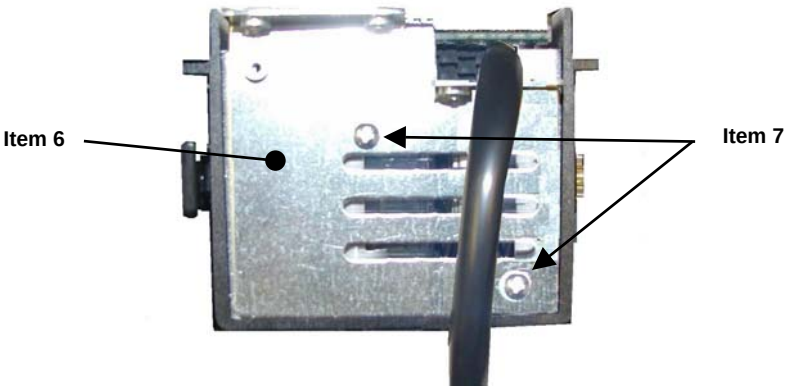
To separate the Lower-Guide Optics Assembly from the Lower-Guide Housing Assembly, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-5.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

1. For 327G and 328G series units, remove two screws (7) that secure Cover Bracket (6) to Lower-Guide Optics Assembly as shown below.



Cover Bracket for 327G and 328G Series

2. Remove four screws (2) from Lower-Guide Assembly (1) (see **Figure 7-18**).
3. Carefully separate Lower-Guide Optics Assembly (5) from Lower-Guide Housing Assembly (3) to access motor connector; disconnect motor connector from Junction J1 on Lower-Guide Optics Assembly.
4. Replace parts as required.

To rejoin the Lower-Guide Optics Assembly to the Lower-Guide Housing Assembly, perform **Steps 1** through **3** in reverse order.

Table 7-5. Lower-Guide Assembly Parts List

(For parts locations, refer to **Figure 7-18**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0006-01, or	Assembly, Lower-Guide, 24-Volt, no Bar Code Reader (BCR), Falcon, LF; this item is used on PN 325G1XXXXXXXG (where, X can be any digit from 1 to 9).	REF
	325D0006-02, or	Assembly, Lower-Guide, 12-Volt, no BCR; this item is used on PN 325G2XXXXXXXG.	REF
	325D0006-03, or	Assembly, Lower-Guide, 24-Volt, with BCR; this item is used on PN 325G7XXXXXXXG.	REF
	325D0006-04, or	Assembly, Lower-Guide, 12-Volt, with BCR; this item is used on PN 325G8XXXXXXXG.	REF
	325D0006-05, or	Assembly, Lower-Guide, 24-Volt, no BCR, sleep activated; this item is used on PN 325GAXXXXXXXG.	REF
	325D0006-06, or	Assembly, Lower-Guide, 12-Volt, no BCR, sleep activated; this item is used on PN 325GBXXXXXXXG.	REF
	325D0006-07, or	Assembly, Lower-Guide, 24-Volt, no Bar; this item is used on PNs 327G1XXXXXXXG and 328G1XXXXXXXG.	REF
	325D0006-08, or	Assembly, Lower-Guide, 12-Volt, no BCR; this item is used on PNs 327G2XXXXXXXG and 328G2XXXXXXXG.	REF
	325D0006-09, or	Assembly, Lower-Guide, 24-Volt, with BCR; this item is used on PNs 327G7XXXXXXXG and 328G7XXXXXXXG.	REF
	325D0006-10, or	Assembly, Lower-Guide, 12-Volt, with BCR; this item is used on PNs 327G8XXXXXXXG and 328G8XXXXXXXG.	REF
	325D0006-11, or	Assembly, Lower-Guide, 24-Volt, no BCR, sleep activated; this item is used on PNs 327GAXXXXXXXG and 328GAXXXXXXXG.	REF
	325D0006-12	Assembly, Lower-Guide, 12-Volt, no BCR, sleep activated; this item is used on PNs 327GBXXXXXXXG and 328GBXXXXXXXG.	REF
2	352-8250-0135	Screw, PFH, 100° (#4-40 x 1/4-inch), Lead Free (LF)	4
3	325D0009-01, or	Assembly, Lower-Guide Housing, Falcon **Note**: This item is used on 325G series.	1
	325D0009-02	Assembly, Lower-Guide Housing, Falcon **Note**: This item is used on 327G series.	1

Table 7-5. Lower-Guide Assembly Parts List

(For parts locations, refer to **Figure 7-18**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
4	325D0007-01, or	Assembly, Lower-Guide Optics, 24-Volt, no BCR; this item is used on PN 325D0006-01.	1
	325D0007-02, or	Assembly, Lower-Guide Optics, 12-Volt, no BCR; this item is used on PN 325D0006-02.	1
	325D0007-03, or	Assembly, Lower-Guide Optics, 24-Volt with BCR; this item is used on PN 325D0006-03.	1
	325D0007-04, or	Assembly, Lower-Guide Optics, 12-Volt with BCR; this item is used on PN 325D0006-04.	1
	325D0007-05, or	Assembly, Lower-Guide Optics, 24-Volt, no BCR, sleep activated; this item is used on PN 325D0006-05.	1
	325D0007-06	Assembly, Lower-Guide Optics, 12-Volt, no BCR, sleep activated; this item is used on PN 325D0006-06.	1
5	325D0007-07, or	Assembly, Lower-Guide Optics, 24-Volt, no BCR, New, LF; this item is used on PN 325D0006-07.	1
	325D0007-08, or	Assembly, Lower-Guide Optics, 12-Volt, no BCR, New, LF; this item is used on PN 325D0006-08.	1
	325D0007-09, or	Assembly, Lower-Guide Optics, 24-Volt with BCR, New, LF; this item is used on PN 325D0006-09.	1
	325D0007-10, or	Assembly, Lower-Guide Optics, 12-Volt with BCR, New, LF; this item is used on PN 325D0006-10.	1
	325D0007-11, or	Assembly, Lower-Guide Optics, 24-Volt, no BCR, sleep activated, New, LF; this item is used on PN 325D0006-11.	1
	325D0007-12	Assembly, Lower-Guide Optics, 12-Volt, no BCR, sleep activated, New, LF; this item is used on PN 325D0006-12.	1
6	351C0056	Bracket, Cover, Falcon, LF **Note**: This item is used on 327G and 328G series.	1
7	352-0440-0157	Screw, PPH, SEMS (#4-40 x 5/16-inch), LF **Note**: This item is used on 327G and 328G series.	2

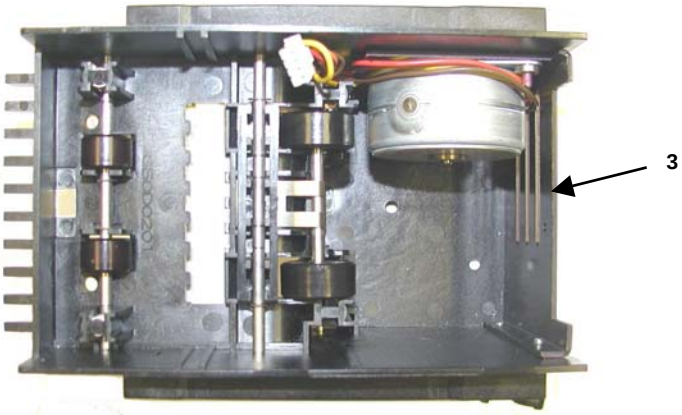
Motor Side View

Latch Side View

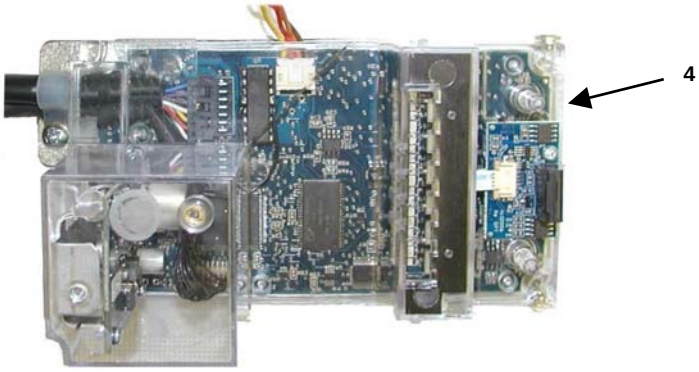
Top View

Figure 7-18. Lower-Guide Assembly Parts Breakdown (Sheet 1 of 2)

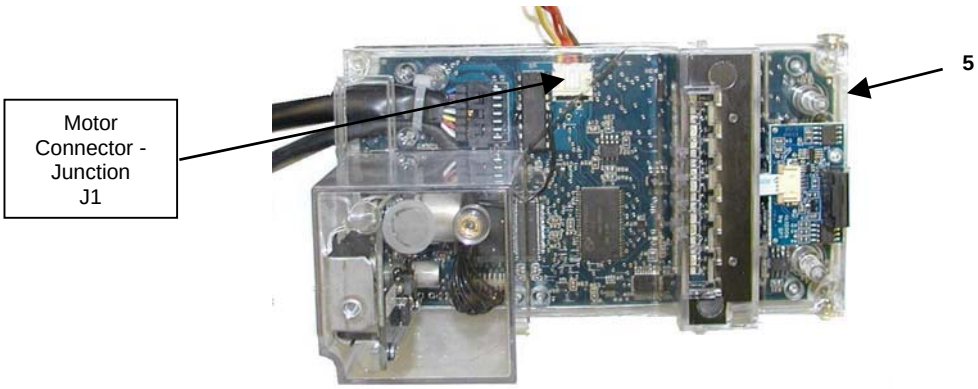
CAUTION: DO NOT allow the motor wires to interfere with moving parts of the Lower-Guide Housing Assembly. Operation of the validator will be impaired if the wires are damaged.



Lower-Guide Housing Assembly (Item 3)



Lower-Guide Optics Assembly (Item 4) –
PNs 325D0006-01 through 325D0006–06



Lower-Guide Optics Assembly (Item 5) –
PNs 325D0006-07 through 325D0006–12

Figure 7-18. Lower-Guide Assembly Parts Breakdown (Sheet 2 of 2)

7.3.2.2 Replacement of Stepper Motor Assembly and Motor Bracket

To remove the Stepper Motor Assembly and Motor Bracket, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-6.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

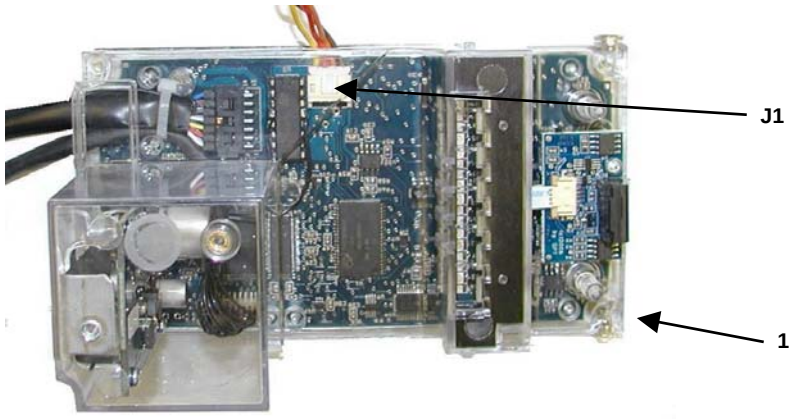
1. Remove Lower-Guide Optics Assembly (1) as described in **Subsection 7.3.2.1**.
2. Disconnect motor connector from junction J1 (see **Figure 7-19**).
3. Remove two screws (2) that secure Stepper Motor Assembly (3) to Lower-Guide Housing Assembly; remove Stepper Motor Assembly.
4. Remove two screws (4) that secure Motor Bracket (5) to Lower-Guide Housing Assembly; remove Motor Bracket.
5. Replace parts as required.

To rejoin the Stepper Motor Assembly and Motor Bracket, perform **Steps 1** through **4** in reverse order; apply a few drops of Loctite (6) to threads of screws (4).

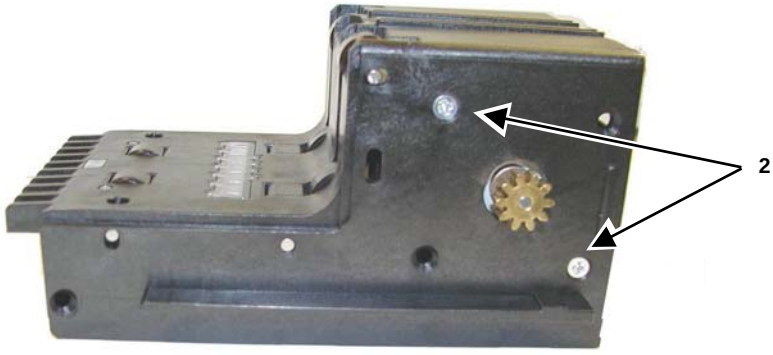
Table 7-6. Stepper Motor Assembly Parts List

(For parts locations, refer to **Figure 7-19**.)

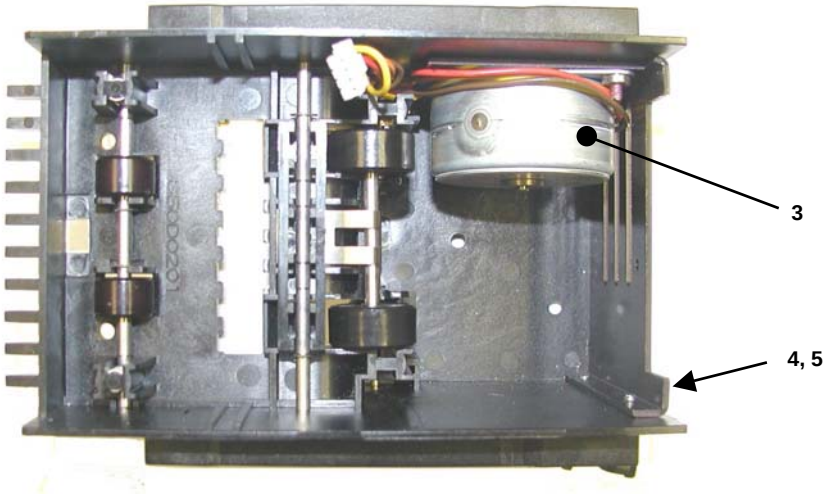
ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0007-XX	Assembly, Lower-Guide Optics **Note**: To determine the part number, refer to **Table 7-5**, **Items 4** and **5**.	REF
2	350A0293	Screw, PFH (#4-40 x 3/8-inch), Lead Free (LF)	2
3	350C0113	Assembly, Stepper Motor	1
4	352-4187-0112	Screw, PFH, 100° (#4-40 x 3/16-inch), LF	2
5	350C0553, or	Bracket, Motor Heat Sink, Aluminum Finish; this item is used on 325G series.	1
	350C0553-1	Bracket, Motor Heat Sink, No Finish; this item is used on 327G and 328G series.	1
6	330-4937-0007	Loctite™ #271, Thread Locking, red (not shown) **Note**: Apply Loctite to threads of Item 2.	A/R



Lower-Guide Optics Assembly – Location of Motor Connector



Lower-Guide Housing Assembly – Motor Side View



Lower-Guide Housing Assembly – Bottom View

Figure 7-19. Stepper Motor Assembly Parts Breakdown

7.3.2.3 Replacement of Front/Rear Pressure Rollers

To remove the front or rear pressure rollers, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-7.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

1. Remove Lower-Guide Optics Assembly as described in **Subsection 7.3.2.1**.
2. Remove and discard two Retaining Clips (4) from Front Idler Axle (5) (see **Figure 7-20**).

CAUTION:

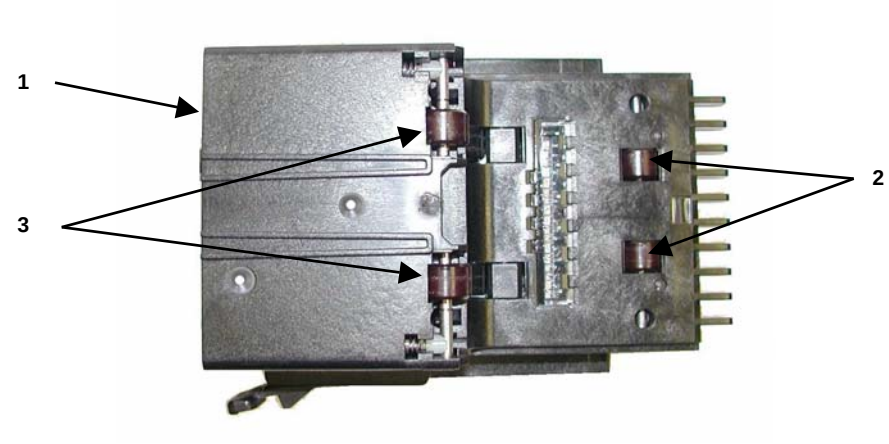
DO NOT use old Retaining Clips; dispose of these parts after removal. Used clips may be bent or have an expanded diameter/width which can impair validator operation. Use only new Retaining Clips to re-secure axles.

3. Slide out Front Idler Axle (5) to the side of housing and remove two Pressure Rollers (2), two Idler Springs (7), and two Plungers (8).
4. Remove and discard two Retaining Clips (4) from Rear Idler Axle (6).
5. Slide out Rear Idler Axle (6) to the side of housing and remove two Pressure Rollers (3), two Idler Springs (7), and two Plungers (8).
6. Replace parts as required.

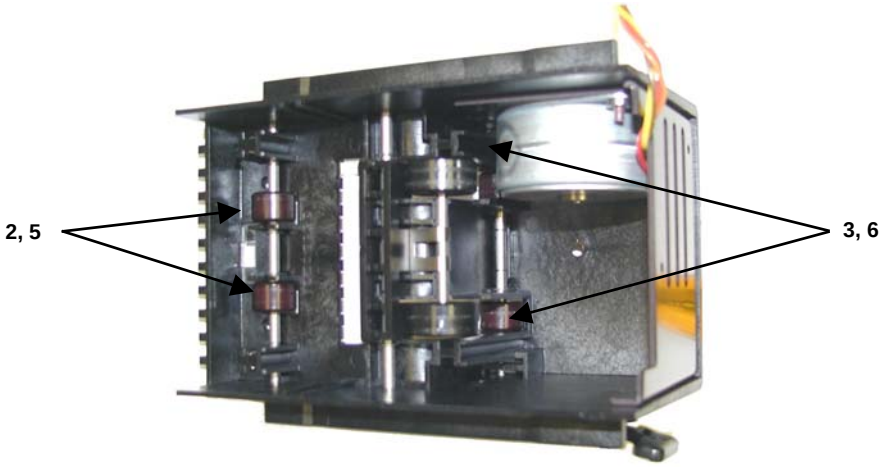
Table 7-7. Front/Rear Pressure Rollers Assembly Parts List

(For parts locations, refer to **Figure 7-20**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0009-01	Assembly, Lower-Guide Housing, Falcon	REF
2	300B0232	Nylon Pressure Rollers (Front)	2
3	300B0232	Nylon Pressure Rollers (Rear)	2
4	324-0002-0002	Retaining Clip (for 0.125-inch diameter shaft), Lead Free	4
5	350B0227	Idler Axle (Front)	1
6	350B0227	Idler Axle (Rear)	1
7	350A0266	Idler Spring	4
8	350B0229	Plunger	4



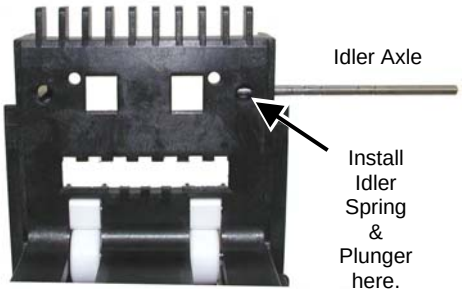
Lower-Guide Housing Assembly – Top View



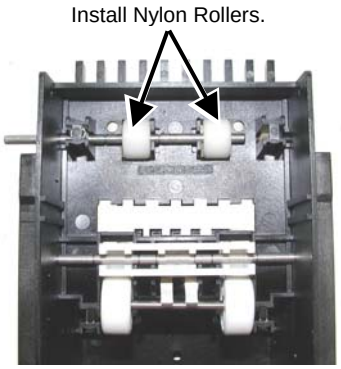
Lower-Guide Housing Assembly – Bottom View

Figure 7-20. Front/Rear Pressure Rollers Parts Breakdown

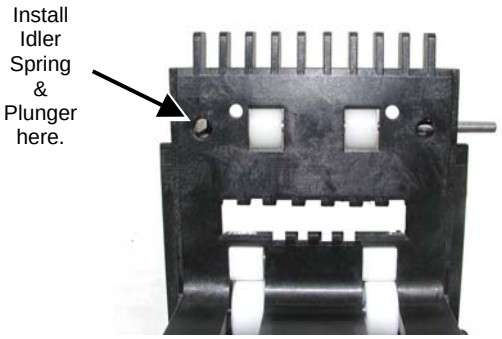
7. To install the front Pressure Rollers, follow these steps (see **Figure 7-21**):
   a) Install Idler Spring (7) and Plunger (8) into slots of housing; ensure tip of Plunger is inserted against Spring.
   b) Depress Plunger and then partially slide Idler Axle (6) inward to engage top of Plunger.
   c) Turn housing over and install two Nylon Pressure Rollers (3) on axle.
   d) Slide Idler Axle (7) inward to engage two Nylon Pressure Rollers (3).
   e) Turn housing over and install Idler Spring (7) and Plunger (8) into housing.
   f) Depress Plunger and then slide Idler Axle inward to engage top of Plunger.
   g) Turn housing over and attach two new Retaining Clips (4) on Idler Axle; to ease installation of clips, align grooves in axle with cutouts in housing.



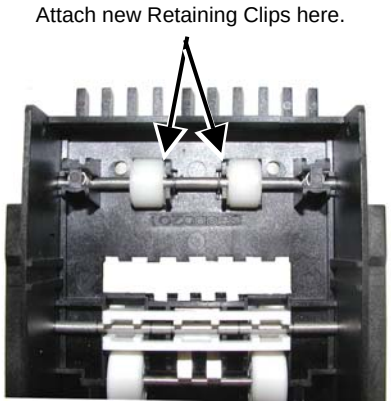
Steps a and b



Steps c and d



Steps e and f



Step g

Figure 7-21. Installation of Front Pressure Rollers

8. To install the rear Pressure Rollers, follow these steps (see **Figure 7-22**):
   a) Stand housing assembly on its motor end, and install Idler Spring (7) and Plunger (8) into slot; ensure tip of Plunger is inserted against Spring.
   b) Depress Plunger, then partially slide Idler Axle (6) inward to engage top of Plunger. Ensure groove in top of Plunger mates properly against axle.
   c) Slide Idler Axle inward and install two Nylon Pressure Rollers (3).
   d) Install Idler Spring (7) and Plunger (8) into housing.
   e) Depress Plunger, then slide Idler Axle (6) inward to engage top of Plunger. Ensure groove in top of Plunger mates properly against axle.
   g) Turn housing over and attach two new Retaining Clips (4) on Idler Axle (6); to ease installation of clips, align grooves in axle with cutouts in housing.

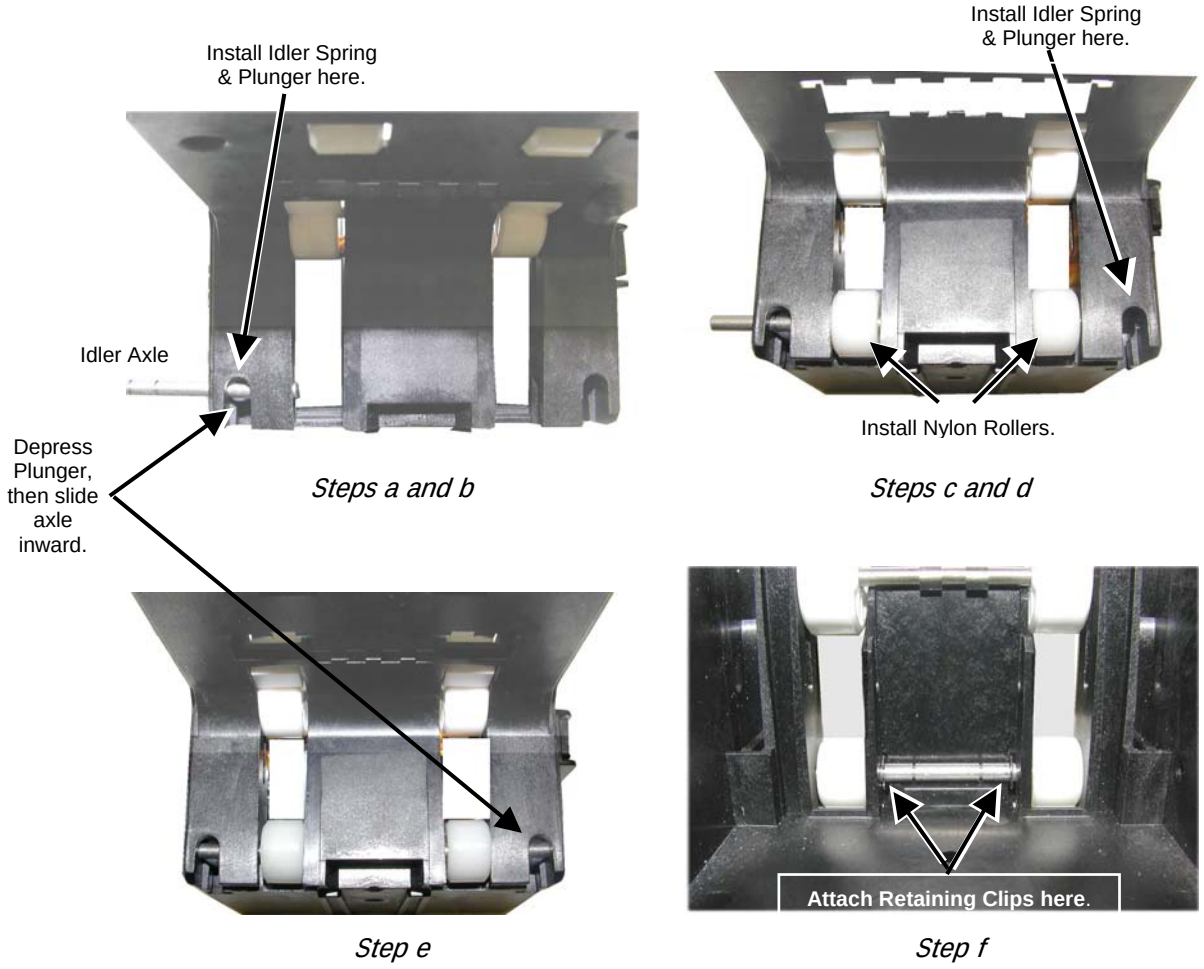


Figure 7-22. Installation of Rear Pressure Rollers

7.3.2.4 Replacement of Idler Wheels, Shaft-Lock Housing, and Idler Spring

To remove the Idler Wheels, Shaft-Lock Housing, and Idler Spring, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-8.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

1. Remove Lower-Guide Optics Assembly as described in **Subsection 7.3.2.1**.

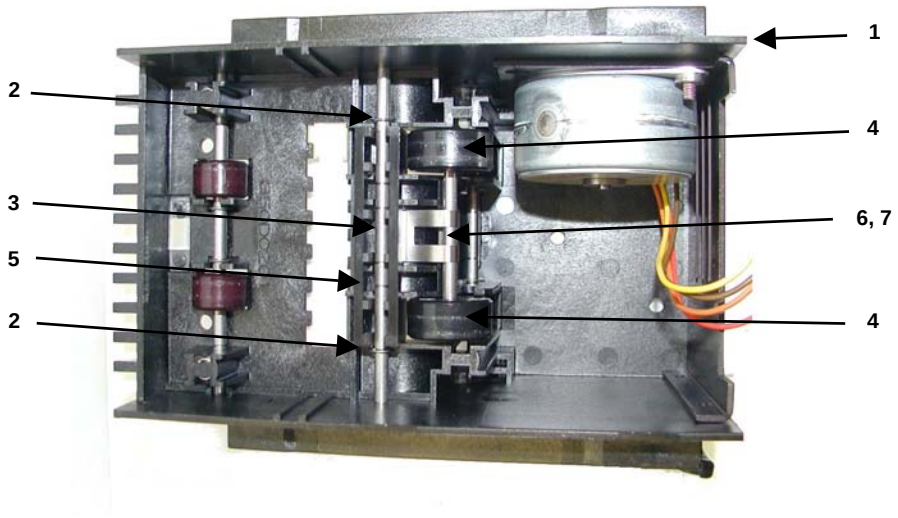
CAUTION: DO NOT reuse old Retaining Clips; dispose of these parts after removal. Used clips may be bent or have an expanded diameter/width which can impair validator operation. Use only new Retaining Clips to re-secure axles.

2. Remove and discard two Retaining Clips (2) from Idler Axle (3) (see **Figure 7-23**).
3. Slide Idler Axle (3) out to side of housing and remove Shaft-Lock Housing (5), Idler Spring (6), and two Idler Wheels (4) with Short Axle (7).
4. Replace parts as required.

Table 7-8. Idler Wheels, Shaft-Lock Housing & Idler Spring Parts List

(For parts locations, refer to **Figures 7-23** and **7-24**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0009-01	Assembly, Lower-Guide Housing, Falcon	REF
2	324-0002-0002	Retaining Clip (for 0.125-inch diameter shafts), Lead Free	2
3	350B0227	Idler Axle	1
4	350B0111	Idler Wheel	2
5	350C0298	Shaft-Lock Housing	1
6	350B0299	Idler Spring	1
7	350B0112	Short Axle	1



Lower-Guide Housing Assembly

Figure 7-23. Idler Wheels, Shaft-Lock Housing, and Idler Spring Parts Breakdown

5. To rejoin the Idler Wheels, Shaft-Lock Housing, and Idler Spring, follow these steps (see **Figure 7-24**):
   a. Place two Idler Wheels (4), with flat surface (or the non-hole side) of wheel facing outward, onto Short Axle (7).
   b. Place Idler Spring (6) onto boss of Lower-Guide Housing Assembly (1).
   c. Attach Short Axle (7), with Idler Wheels (4), onto Idler Spring (6).
   d. Place Shaft-Lock Housing (5) onto Idler Spring (6).
   e. Insert Idler Axle (3) into housing and then slide it into slot of Shaft-Lock Housing (5); press Idler Axle down to engage it into hole of housing.
   f. Attach two new Retaining Clips (2) onto Idler Axle (3).
   g. Adjust tension of Idler Spring (6) (refer to **Subsection 7.3.2.4.1**).

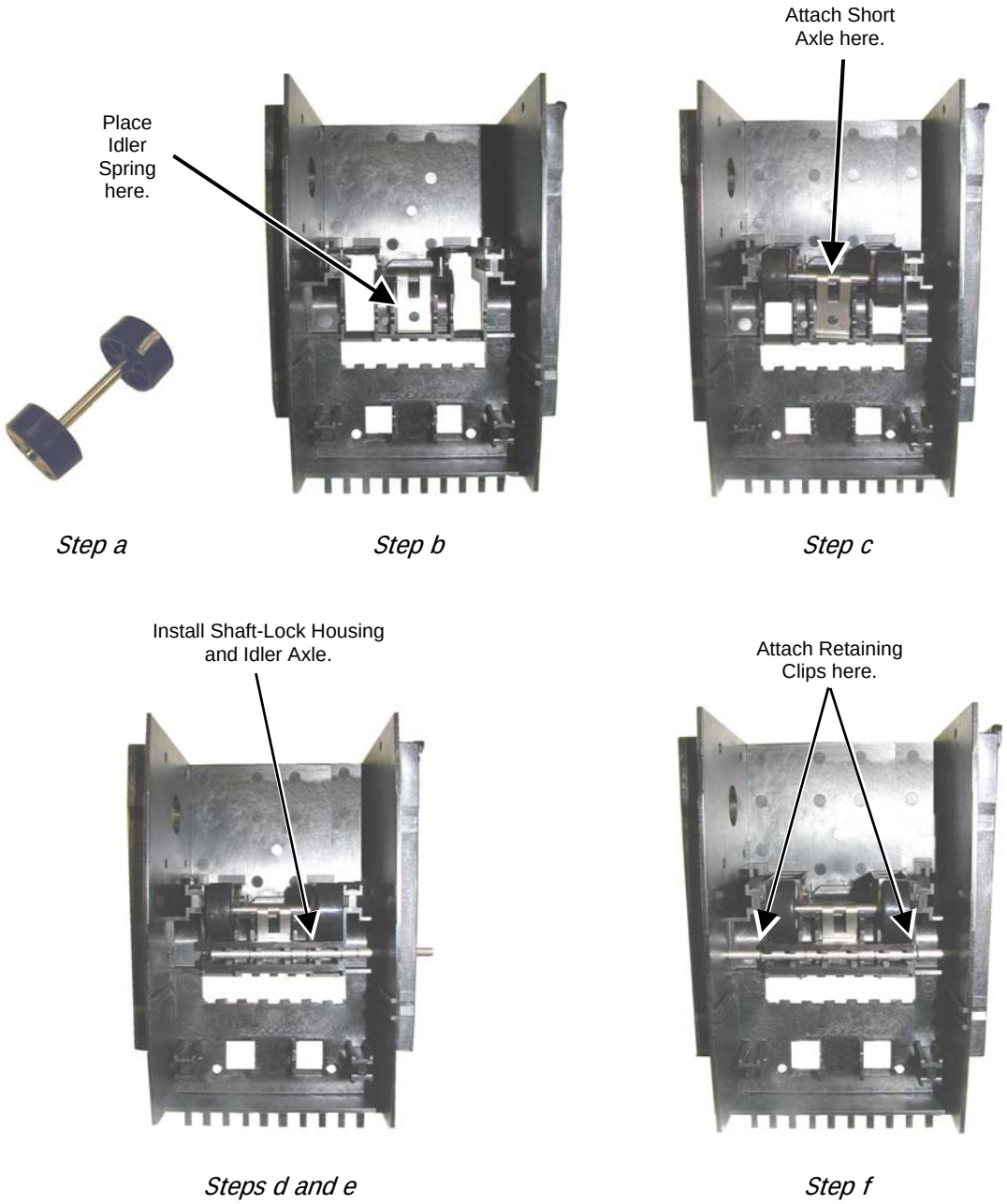


Figure 7-24. Installation of Idler Wheels, Shaft-Lock Housing & Idler Spring

7.3.2.4.1 Idle Spring Tension Adjustment Procedure

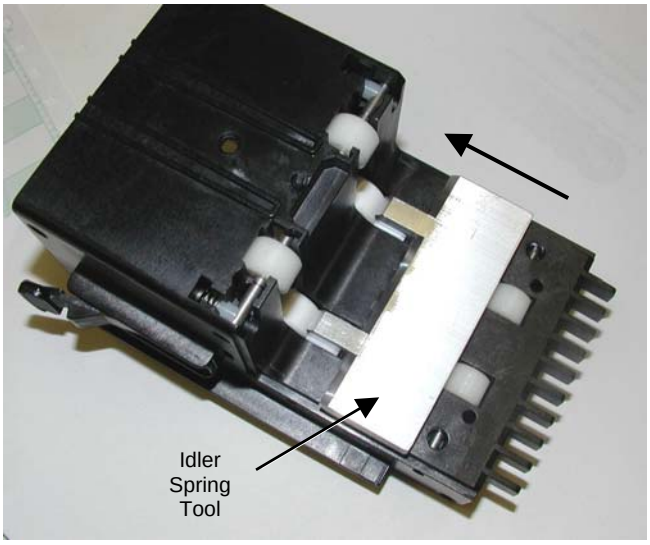
CAUTION: The following steps describe two methods to adjust the tension of the Idle Spring. For either method, the amount of pressure applied to the spring is very important. If the spring is not bent sufficiently (too stiff), the Idler Wheels will not turn freely. Consequently, the Drive Rollers with O-rings can prematurely wear out. On the other hand, if the spring is bent too much, the Short Axle can fall off the Idler Spring.

Method 1: To adjust the Idler Spring (6) with the Idler Spring Adjustment Tool (*GPT* PN 350B0557) (see **Figure 7-25**):

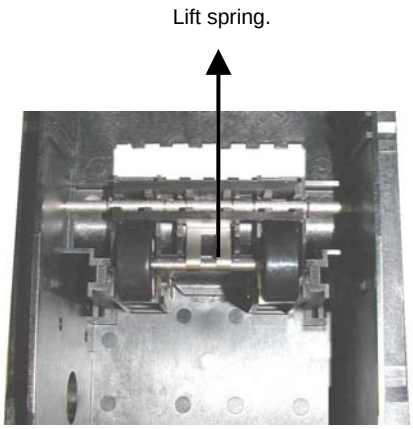
1. Place Idler Spring Adjustment Tool onto housing.
2. While applying downward pressure, slide tool inward toward Idler Wheels until tool rests against housing, and then release tool.
3. Check that Idler Wheels spin freely.

Method 2: To adjust the Idler Spring manually without the tool:

1. Lift spring.
2. Check that Idler Wheels spin freely.



Method 1



Method 2

Figure 7-25. Adjustment of Idler Spring

7.3.2.5 Replacement of Latch

To remove the latch, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-9.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

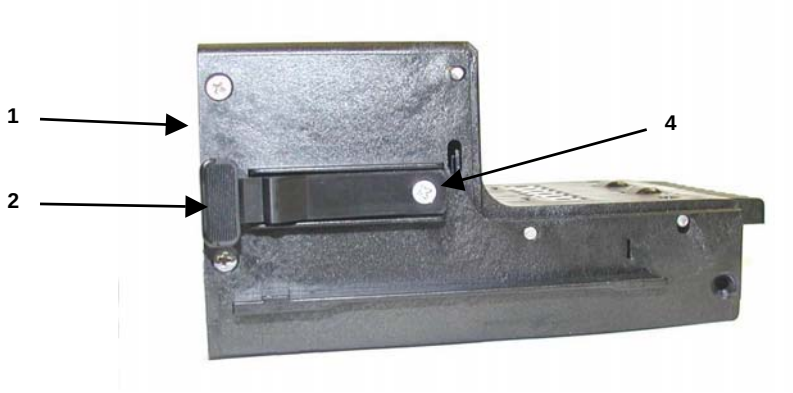
1. Remove one screw (4) from Latch (2) (see **Figure 7-26**).
2. Remove internal Spring Latch (3).
3. Replace parts as required.

To install the Latch, perform **Steps 1** and **2** in reverse order.

Table 7-9. Latch Parts List

(For parts locations, refer to **Figure 7-26**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0009-01	Assembly, Lower-Guide Housing, Falcon	REF
2	350C0238	Latch	1
3	350A0291	Latch, Spring (not shown)	1
4	352-8250-0135	Screw, PFH, 100° (#4-40 x 1/4-inch), Lead Free	1



Lower-Guide Assembly – Latch Side View

Figure 7-26. Latch Parts Breakdown

7.3.3 Lower-Guide Optics Assembly Breakdown

This section provides instructions to replace components of the Lower-Guide Optics Assembly. Prior to performing this procedure, the Lower-Guide Assembly should be separated from the Upper-Guide Assembly.

The parts of the Lower-Guide Optics Assembly, which can be replaced, are:

- Main Assembly (refer to **Subsection 7.3.3.1**)
- Regulator Assembly (refer to **Subsection 7.3.3.2**)
- Bar Code Reader PCB Assembly (refer to **Subsection 7.3.3.3**)

To replace the faulty part(s), proceed to the applicable subsection and perform the removal instructions.

7.3.3.1 Replacement of Main Assembly

To replace the Main Assembly, follow these steps:

CAUTION: DO NOT allow Electrostatic Discharge (ESD) to damage the validator's electronic circuits; follow all industry-accepted ESD-prevention procedures when replacing components.

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-10.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

1. Remove Lower-Guide Optics Assembly (1a) or (1b) as described in **Subsection 7.3.2.1.**
2. For 325G series units only, remove screw (13) and washer (14) that secures cable clamp (15) to Lower-Guide Optics Cover (9) (see **Figure 7-27**).
3. For 325G series units, remove four screws (10) that secure Lower-Guide Optics Cover (9a); for 327G and 328G series units, remove six screws (10) that secure Lower-Guide Optics Cover (9b).
4. Detach Flat-Flex Cable Assembly (7) at Junction J6 on bottom-side of Main Assembly PCB (5a).
5. Remove five screws (11) that secure Main Assembly (5) to Lower-Guide Optics Inseparable Assembly (8); carefully position Main Assembly away from Lower-Guide Optics Inseparable Assembly.
6. Detach connector of Regulator Assembly PCB (4) from connector J5 on Main Assembly PCB (5a).
7. Replace parts as necessary.

To rejoin the Main Assembly to the Lower-Guide Optics Assembly, perform **Steps 1** through **6** in reverse order.

Table 7-10. Lower-Guide Optics Assembly Parts List

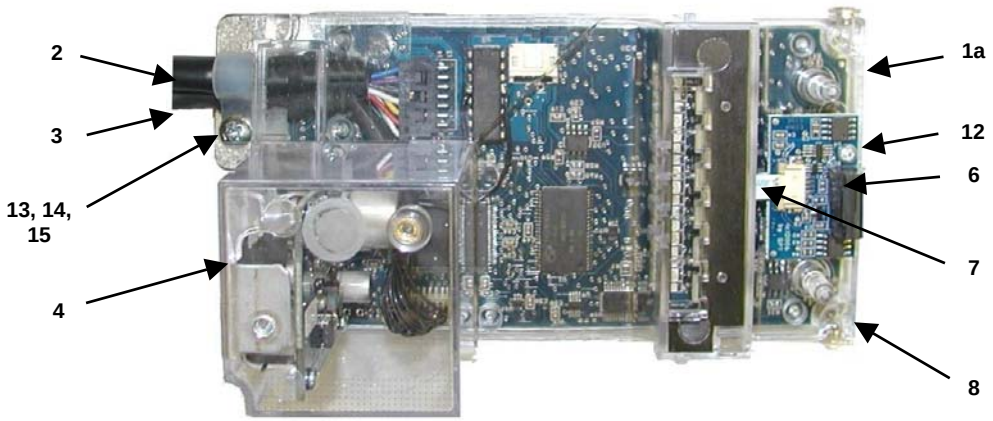
(For parts locations, refer to **Figures 7-27**, **7-28**, **7-29**, and **7-30**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1a	325D0007-01 thru -06, or	Assembly, Lower-Guide Optics, Falcon; this item is used on 325G series.	REF
1b	325D0007-07 thru -12	Assembly, Lower-Guide Optics, New, Falcon; this item is used on 327G and 328G series.	REF
2	325EC003G, or	Assembly, Cable, Main, Falcon, Lead Free (LF); this item is used on PNs 325D0007-01, 325D0007-03, 325D0007-05, 325D0007-07, 325D0007-09, and 325D0007-11.	REF
	325EC010G	Assembly, Cable, Main, Falcon, Lead Free (LF); this item is used on PNs 325D0007-02, 325D0007-04, 325D0007-06, 325D0007-08, 325D0007-10, and 325D0007-12.	REF
3	325EC002G, or	Assembly, Cable, Lower-to-Upper Guide, LF; this item is used on PN 325D0003-01.	REF
	325EC008G	Assembly, Cable, Lower-to-Upper Guide, LF; this item is used on PNs 325D0003-03 and 325D0003-04.	REF
4	325D0001-01, or	Assembly, 24-Volt Regulator; this item is used on PNs 325D0007-01, 325D0007-03, and 325D0007-05.	1
	325D0001-02, or	Assembly, 12-Volt Regulator; this item is used on PNs325D0007-02, 325D0007-04, and 325D0007-06.	1
	325D0001-03, or	Assembly, 24-Volt Regulator; this item is used on PNs325D0007-07, 325D0007-09, and 325D0007-11.	1
	325D0001-04	Assembly, 12-Volt Regulator; this item is used on PNs325D0007-08, 325D0007-10, and 325D0007-12.	1
		The parts breakdown for Item 4 includes:	
4a	325EA004G-01, or	Assembly, PCB, 24-Volt Power Supply Regulator; this item is used on PN 325D0001-01; see **Note 1** below.	1
	325EA005G-01, or	Assembly, PCB, 12-Volt Power Supply Regulator; this item is used on PN 325D0001-02; see **Note 2** below.	1
	325EA010G-01, or	Assembly, PCB, 24-Volt Power Supply Regulator; this item is used on PN 325D0001-03; see **Note 3** below.	1
	325EA006G-01	Assembly, PCB, 12-Volt Power Supply Regulator; this item is used on PN 325D0001-04; see **Note 3** below.	1
4b	351C0018	Bracket, Power Supply	1
4c	350A0256	Screw, PPH (#2-56UNC-2AX19LG), LF	4

Table 7-10. Lower-Guide Optics Assembly Parts List

(For parts locations, refer to **Figures 7-27**, **7-28**, **7-29**, and **7-30**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
4d	351A0054	Washer, Fiber, 0.090 x 0.187 x 0.15-inch, LF **Notes**: **1**. Four fiber washers are required for PCB Assembly, PN 325EA004G-01. **2**. One fiber washer is required for PCB Assembly, PN 325EA005G-01. **3**. Fiber washers are not required for PCB Assemblies PNs 325EA010G-01 and 325EA006G-01.	4, 1
5	325D0002-01, or	Assembly, Main, Falcon, LF; this item is used on PNs 325D0007-01 through 325D0007-04, and 325D0007-07 through 325D0007-10.	1
	325D0002-02	Assembly, Main, Falcon, Sleep Activated, LF; this item is used on PNs 325D0007-05, 325D0007-06, 325D0007-11 and 325D0007-12.	1
		The parts breakdown for Item 5 includes:	
5a	325EA001G-01, or	Assembly, Main PCB, LF; this item is used on PN 325D0002-01 only.	1
	325EA001G-02	Assembly, Main PCB, sleep activated, LF; this item is used on PN 325D0002-02 only.	1
5b	350C0231	Assembly, Reflective Array Shroud	1
5c	352-2N25-0178	Screw, PHF, self-tapping (#2 x 1/4-inch), LF	2
6	325EA007G-01	Assembly, Bar Code Reader PCB; this item is used on PNs 325D0007-03, 325D0007-04, 325D0007-09, and 325D0007-10.	1
7	325EC006G	Assembly, Cable, Flat-Flex, 4-inch; this item is used on PNs 325D0007-03, 325D0007-04, 325D0007-09, and 325D0007-10.	1
8	325D0011-01	Assembly, Lower-Guide Optics Inseparable Housing with Shield, Falcon	1
9a	351C0017-02	Cover, Lower-Guide, Falcon; this item is used on PNs 325D0007-01 through 325D0007-06.	1
9b	351C023-02	Cover, Lower-Guide, Falcon; this item is used on PNs 325D0007-07 through 325D0007-12.	1
10	352-0440-0168	Screw, Truss-Head (#4-40 x 3/16-inch), LF **Note**: Six screws are used for Item 9b.	4 or 6
11, 12	351A0024	Screw, Thread, M2 (2-mm x 5-mm), Type H, LF **Note**: Item 12 secures Item 6 to Item 8.	5 or 6
13	352-0440-0157	Screw, PPH, SEMS (#4-40 x 5/16-inch), LF	1
14	351A0055	Washer, Flat, 0.125 x 0.312 x 0.032-inch, SS, LF	1
15	300A0725	Clamp, Cable, Single Mount	1

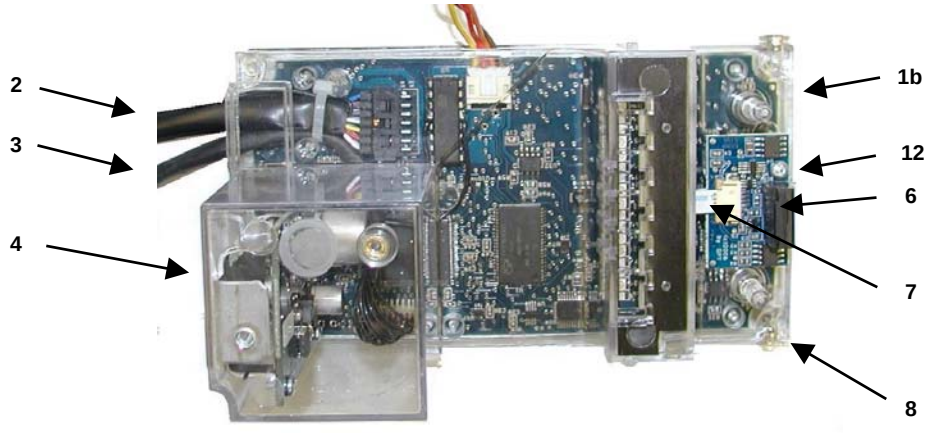


Top View

Bottom View with Cover

Bottom View with Cover Removed

Figure 7-27. Lower-Guide Optics Assembly Parts Breakdown for PNs 325D0007-01 through 325D0007-06



Top View

Bottom View with Cover

Bottom View with Cover Removed

Figure 7-28. Lower-Guide Optics Assembly Parts Breakdown for PNs 325D0007-07 through 325D0007-12

7.3.3.2 Replacement of Regulator Assembly

To replace the Regulator Assembly, follow these steps:

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-10.

2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

1. Remove Main Assembly (5) as described in **Subsection 7.3.3.1.**
2. Detach four screws (4c) that secure Power Supply Regulator PCB Assembly (4a) to Bracket (4b) (see **Figure 7-29**).

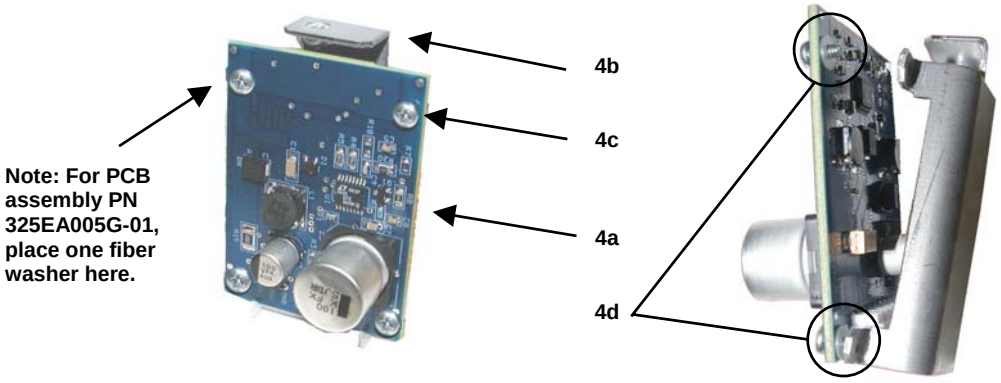


Figure 7-29. Regulator Assembly Parts Breakdown

3. Replace parts as necessary.
4. To rejoin the Power Supply Regulator PCB Assembly to the Bracket, follow these steps:
   a. Insert screw (4c) through mounting hole of Power Supply Regulator PCB Assembly (4a).

CAUTION:

DO NOT directly attach the Power Supply Regulator PCB Assembly (4a) to the Bracket (4b) when installing PCB assemblies PNs 325EA004G-01 and 325EA005G-01; ensure fiber washers (4d) are placed between the PCB and the Bracket to avoid damage to the PCB Assembly.

   b. Attach fiber washer (4d) to screw (4c), and then secure Power Supply Regulator PCB Assembly (4a) to Bracket (4b); do not fully tighten screw.
   c. Repeat **Steps a** and **b** to install three screws (4c) and three washers (4d); tighten all screws to 2.8 inch-pounds.
5. To rejoin the Main Assembly (5) to the Lower-Guide Optics Assembly, perform the steps in **Subsection 7.3.3.1**.

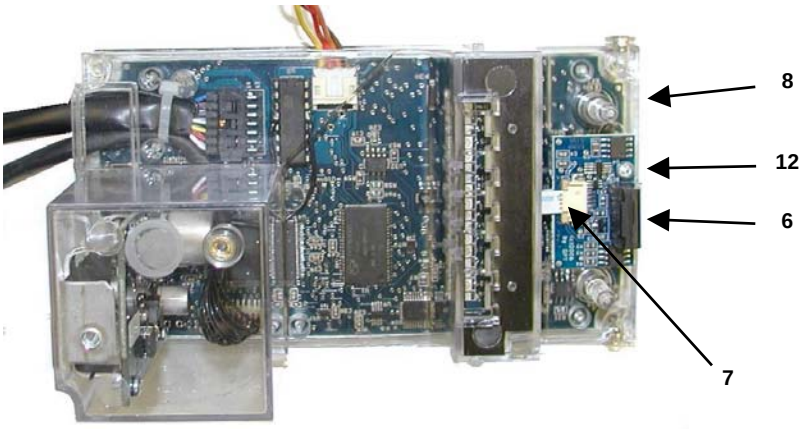
7.3.3.3 Replacement of Bar Code Reader PCB Assembly

To replace the Bar Code Reader PCB Assembly, follow these steps:

Note: For the following steps, numbers in parentheses correspond to the item numbers in Table 7-10.

1. Separate Lower-Guide Optics Assembly (1) from Lower-Guide Housing Assembly as described in **Subsection 7.3.2.1**.
2. Remove screw (12) that secures Bar Code Reader PCB Assembly (6) to Lower-Guide Optics Inseparable Housing Assembly (8) (see **Figure 7-30**).
3. Detach Flat-Flex Cable Assembly (7) at Junction J1 on Bar Code Reader PCB Assembly.
4. Replace parts as required.

To rejoin the Bar Code Reader PCB Assembly to the Lower-Guide Optics Inseparable Housing Assembly, perform **Steps 1** through **3** in reverse order.



Lower-Guide Optics Assembly

Figure 7-30. Bar Code Reader Assembly Parts Breakdown

7.4 Upper-Guide Assembly Parts Breakdown

Instructions to replace components of the Upper-Guide Assembly are in this section. Prior to performing this procedure, the Lower-Guide Assembly should be separated from the Upper-Guide Assembly.

The major assemblies of the Upper-Guide are:

- Upper-Guide Housing Assembly (refer to **Subsection 7.4.2**)
- Upper-Guide Optics Assembly (refer to **Subsection 7.4.3**).

7.4.1 Required Tools

The following tools are required:

- Screwdriver, Phillips-head #1
- Screwdriver, flat-head #2
- Retaining Clip Installation Tool (Rotor Clip, PN A130)
- Pliers, 5-inch needle nose.

7.4.2 Upper-Guide Housing Assembly – Disassembly Procedure

This section describes how to disassemble the Upper-Guide Housing Assembly.

WARNINGS:

1. AVOID PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE VALIDATOR. DISCONNECT POWER SUPPLY BEFORE CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.
2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CLEAN OR REPAIR VALIDATOR IN A DAMP OR WET ENVIRONMENT.
3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

CAUTIONS:

1. DO NOT allow Electrostatic Discharge (ESD) to damage the validator's electronic circuits; follow all industry-accepted ESD-prevention procedures when replacing components.
2. DO NOT use old Retaining Clips; dispose of these parts after removal. Used clips may be bent or have an expanded diameter/width which can impair validator operation. Use only new Retaining Clips to re-secure axles.

The parts of the Upper-Guide Housing Assembly, which can be replaced, are:

- Upper-Guide Optics Assembly (refer to **Subsection 7.4.2.1**)
- Idler/Drive Gears and Timing Belt (refer to **Subsection 7.4.2.2**)
- Latch Spring (refer to **Subsection 7.4.2.3**)
- Rear Sensor Prism and SLS Optical Lenses (refer to **Subsection 7.4.2.4**).

To replace the faulty part(s), proceed to the applicable subsection and perform the removal instructions.

7.4.2.1 Replacement of Upper-Guide Optics Assembly

This section contains instructions to replace the Upper-Guide Optics Assembly for Falcon's Models G3V, FL-4, and FL-6.

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-11.

2. Removal of the Upper-Guide Optics Assembly is eased when the Bezel and the Support Bracket Assemblies are removed from the unit.

3. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

Table 7-11. Upper-Guide Assembly Parts List

(For parts locations, refer to **Figure 7-31**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0003-01, or	Assembly, Upper-Guide, Model G3V; this item is used on 325G series.	REF
	325D0003-03	Assembly, Upper-Guide, Model G3V; this item is used on 327G series.	REF
2	325D0003-04	Assembly, Upper-Guide, Model FL-4/FL-6; this item is used on 328G series.	REF
3	325D0004-01	Assembly, Upper-Guide Optics	1
4	325D0010-01	Assembly, Upper-Guide Housing, Model G3V	1
5	325D0010-02	Assembly, Upper-Guide Housing, Model FL-4/FL-6	1
6	352-4250-0117	Screw, SEMS PPH (#4-40 x 1/4-inch), Lead Free	2
7	350D0248	Assembly, Cover Gear Housing, Model G3V	REF
8	351D0003	Assembly, Cover Gear Housing, Model FL-4/FL-6	REF

To remove the Upper-Guide Optics Assembly, follow these steps:

1. For Model G3V:
   a. Remove Bezel Assembly as described in **Subsection 7.2.3**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.4**.
   c. Remove two screws (6), one-per-side, that hold Upper-Guide Optics Assembly (3) to Upper-Guide Housing Assembly (4) (see **Figure 7-31**).

Note: Screw (6) is hidden is hole of Cover Gear Housing Assembly (7) or (8).

   d. Lift Upper-Guide Optics Assembly (3) from Upper-Guide Housing Assembly (4).
2. For Model FL-4:
   a. Remove Bezel Assembly as described in **Subsection 7.2.5**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.6**.
   c. Remove two screws (6), one-per-side, that hold Upper-Guide Optics Assembly (3) to Upper-Guide Housing Assembly (4) (see **Figure 7-31**).

Note: Screw (6) is hidden is hole of Cover Gear Housing Assembly (7) or (8).

   d. Lift Upper-Guide Optics Assembly (3) from Upper-Guide Housing Assembly (4).
3. For Model FL-6:
   a. Remove Bezel Assembly as described in **Subsection 7.2.7**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.8**.

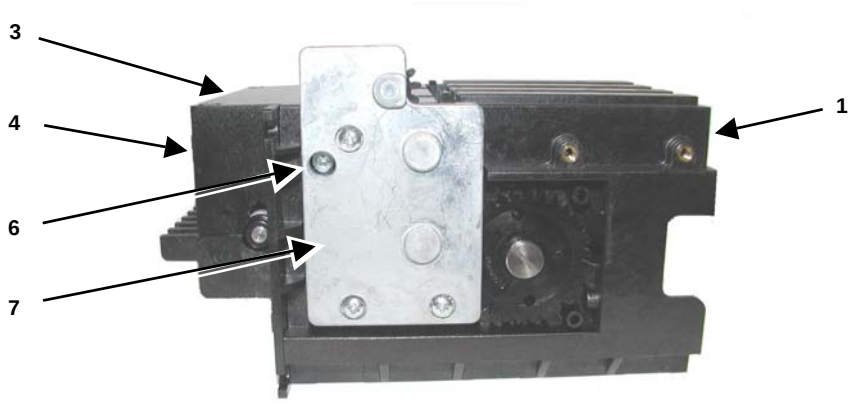
Note: At this time, the Bezel Assembly and the Support Bracket Assembly should be removed from the unit.

4. Remove two screws (6), one-per-side, that hold Upper-Guide Optics Assembly (3) to Upper-Guide Housing Assembly (4) (see **Figure 7-31**).

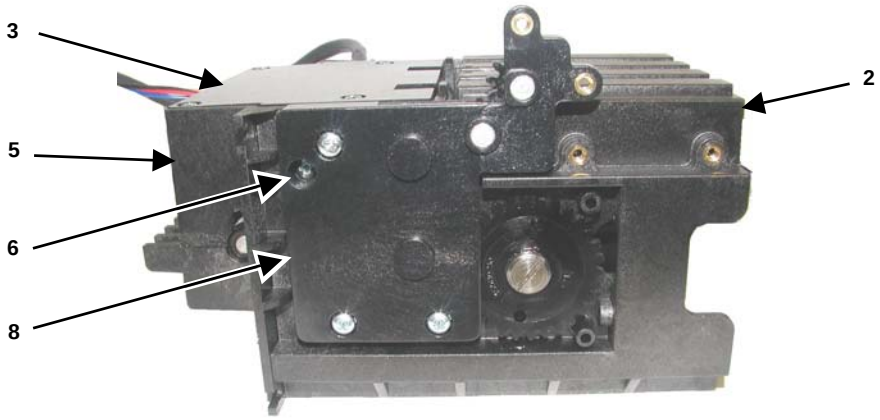
Note: Screw (6) is hidden is hole of Cover Gear Housing Assembly (7) or (8).

5. Lift Upper-Guide Optics Assembly (3) from Upper-Guide Housing Assembly (4).

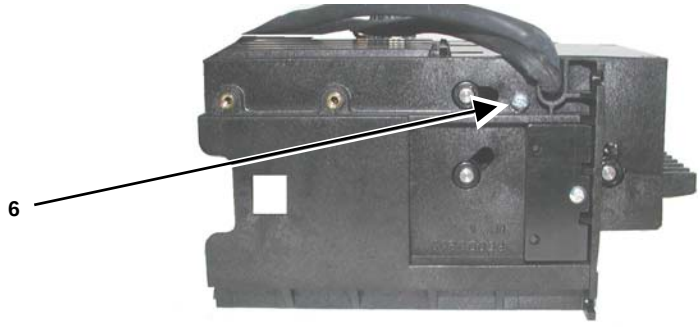
To perform maintenance on the Upper-Guide Optics Assembly, proceed to **Subsection 7.4.3**.



Model G3V – Gear Side View



Models FL-4 and FL-6 – Gear Side View



All Models – Non-Gear Side View

Figure 7-31. Upper-Guide Assembly Parts Breakdown

7.4.2.2 Replacement of Idler/Drive Gears, Axles, and Timing Belt

Instructions to replace the Idler and Drive Gears, Drive Axles and Timing Belt used on the Upper-Guide Housing Assembly for all Falcon models are in this section.

Note: For the following steps, numbers in parentheses correspond to the item numbers in Table 7-12.

Table 7-12. Upper-Guide Housing Assembly Parts List

(For parts locations, refer to **Figure 7-32**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0010-01	Assembly, Upper-Guide Housing, Model G3V	REF
	325D0010-02	Assembly, Upper-Guide Housing, Model FL-4/FL-6 (not shown)	REF
2	352-4250-0117	Screw, SEMS PPH (#4-40 x 1/4-inch), Lead Free	4
3	350D0248	Assembly, Cover Gear Housing, Model G3V	REF
	351D0003	Assembly, Cover Gear Housing, Model FL-4/FL-6 (not shown)	REF
4	350B0210	Idler Gear, 30T-24P	1
5	350B0237	Screw, Shoulder	1
6	350B0211	Idler Gear, 12T-24P	1
7	350B0212	Idler Bushing	1
8	350B0213	Pivot Bushing	6
9, 10	350B0209	Drive Gear, 18T-24P	2
11	350A0267	Retaining Clip, 0.250-inch diameter shaft, LF	4
12	350B0251	Assembly, Gear-Drive Axle (upper)	1
13	350B0251	Assembly, Gear-Drive Axle (lower)	1
14	350B0215	Drive Pulley	1
15	350B0250	Assembly, Front-Drive Axle	1
16	350A0263	Timing Belt, 54T-0.80P	1
17	210B0703	Link Spacer	1
18	261-0001-0003	Synthetic grease (not shown)	A/R
19	261-0001-0004	LPS-1 Greaseless lubricant (not shown)	A/R
20	330-2241-0007	Locktite™, Thread Locking (purple) (not shown)	A/R

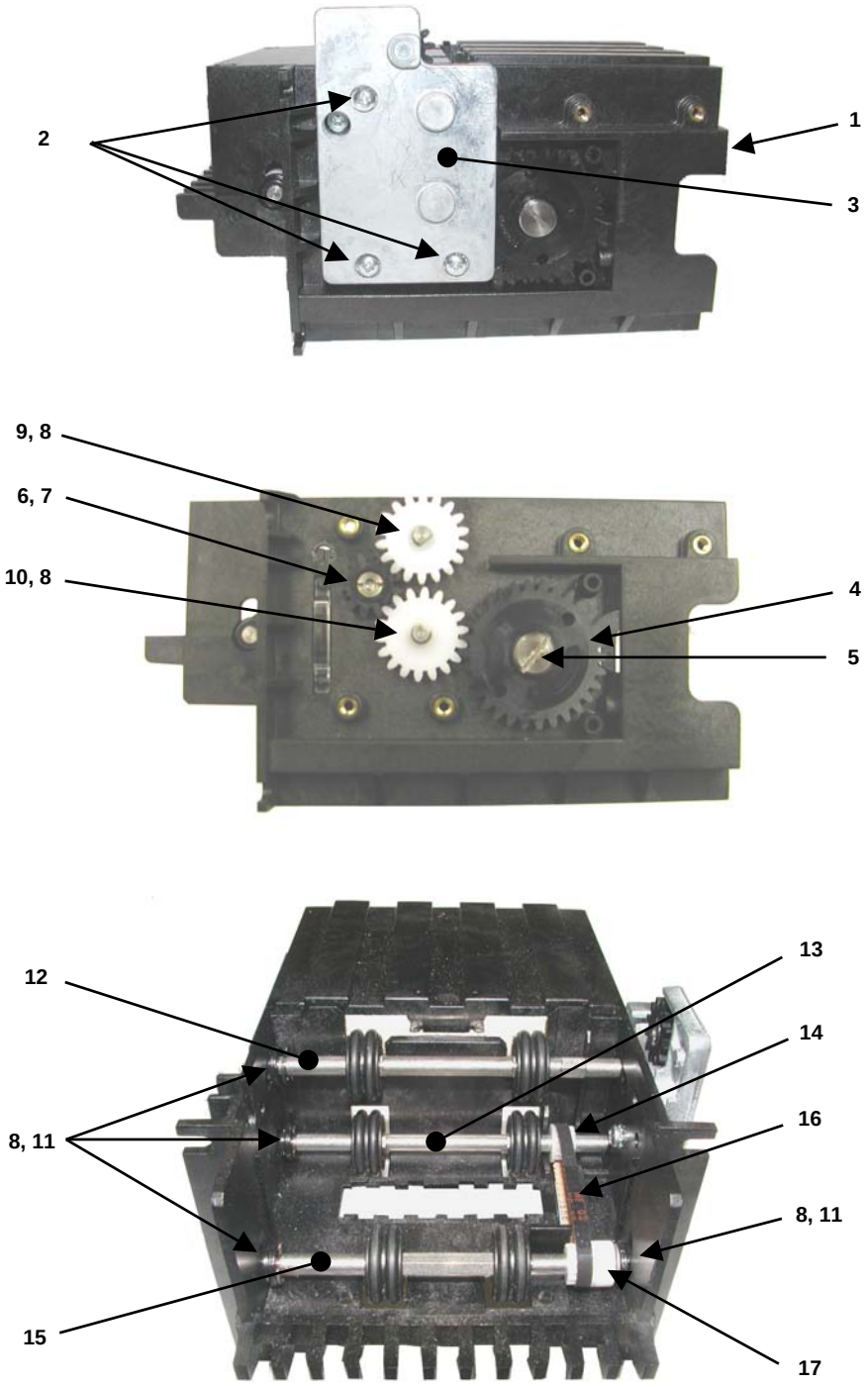


Figure 7-32. Upper-Guide Housing Assembly Parts Breakdown

1. Remove Upper-Guide Optics Assembly as described in **Subsection 7.4.2.1**.
2. To remove the Timing Belt (16), follow these steps (see **Figure 7-32**):
    a. Remove three screws (2) holding Gear Cover (3), and then remove cover.
    b. Remove white, 18-tooth Drive Gear (9) and Pivot Bushing (8).
    c. Remove and discard one Retaining Clip (11) from Lower-Gear Drive Axle Assembly (12).
    d. Slide Pivot Bushing (8) inward on axle, and then remove axle, with bushing, from housing.
    e. Remove and discard two Retaining Clips (11) from Front-Drive Axle Assembly (15).
    f. Slide two Pivot Bushings (8) inward on axle, and then remove axle, with Timing Belt (16) and Link Spacer (17), from housing.
    g. Replace parts as required.
3. To remove the Front-Drive Axle Assembly (15), follow these steps (see **Figure 7-32**):
    a. Remove and discard two Retaining Clips (11) from Front-Drive Axle Assembly (15).
    b. Slide two Pivot Bushings (8) inward on axle, and then remove axle, with Link Spacer (17), from housing.
    c. Replace parts as required.
    d. To install Front-Drive Axle Assembly (15), follow these steps:
        1) Install Link Spacer (17), two Pivot Bushings (8), and Timing Belt (16) onto axle.
        2) Position Timing Belt (16) onto teeth of drive pulley.
        3) Slide Pivot Bushings (8) into cutouts of housing.
        4) Attach two new Retaining Clips (11) to lock Front-Drive Axle Assembly in place.
4. To remove the Upper-Gear Drive Axle Assembly (12), follow these steps (see **Figure 7-32**):
    a. Remove three screws (2) holding Gear Cover (3), and then remove cover.
    b. Remove white, 18-tooth Drive Gear (9) and Pivot Bushing (8).
    c. Remove and discard one Retaining Clip (11) from Upper-Gear Drive Axle Assembly (12).
    d. Slide Pivot Bushing (8) inward on axle, and then remove axle, with bushing, from housing.
    e. Replace parts as required.

f. To install Upper-Gear Drive Axle Assembly (12), follow these steps:
   1) Install two Pivot Bushings (8) onto axle.
   2) Slide Pivot Bushings (8) into cutouts of housing.
   3) Attach two new Retaining Clips (11) to lock Upper-Gear Drive Axle Assembly in place.

5. To remove the Lower-Gear Drive Axle Assembly (13), follow these steps (see **Figure 7-32**):
   a. Remove three screws (2) holding Gear Cover (3), and then remove cover.
   b. Remove white, 18-tooth Drive Gear (10) and Pivot Bushing (8).
   c. Remove and discard one Retaining Clip (11) from Lower-Gear Drive Axle Assembly (13).
   d. Slide Pivot Bushing (8) inward on axle, and then remove axle, with bushing with and Drive Pulley (14), from housing.
   e. Replace parts as required.
   f. To install Lower-Gear Drive Axle Assembly (13), follow these steps:
      1) Install Drive Pulley (14), two Pivot Bushings (8), and Timing Belt (16) onto axle.
      2) Position Timing Belt (16) onto teeth of drive pulley.
      3) Slide Pivot Bushings (8) into cutouts of housing.
      4) Attach two new Retaining Clips (11) to lock Lower-Gear Drive Axle Assembly in place.

6. To remove the Idler and Drive Gears, follow these steps (see **Figure 7-32**):
   a. Remove three screws (2) holding Gear Cover (3) to housing, and then remove cover.
   b. Remove screw (2) holding 12-tooth Idler Gear (6) to housing, and then remove gear and Idler Bushing (7).
   c. Remove shoulder screw (5) holding 30-tooth Idler Gear (4) to housing, and then remove gear.
   d. Remove white, 18-tooth Drive Gear (9) with Pivot Bushing (8); repeat for second gear (10) and Pivot Bushing (8)**.**
   e. Replace parts as required.
   f. To install Idler (6) and Drive Gears (9), follow these steps:
      1) Place Pivot Bushing (8) and white, 18-tooth Drive Gear (9), with part number side of gear first, onto axle; repeat for second gear (10) and Pivot Bushing (8).
      2) Install 12-tooth Idler Gear (6) with Idler Bushing (7); secure gear to housing with screw (2).
   g. To Install 30-tooth Idler Gear (4) with Shoulder Screw (5) as follows:
      1) Apply grease (19) to shoulder of screw (5).
      2) Apply Locktite™ (20) to threads of screw (5).
      3) Tighten screw to a torque setting of 5.0 inch/pounds.

7.4.2.3 Replacement of Latch Spring

Instructions to replace the Latch Spring used on the Upper-Guide Housing Assembly for all Falcon models are in this section.

To remove the Latch Spring, follow these steps:

Note: For the following steps, numbers in parentheses correspond to the item numbers in Table 7-13.

1. Remove one screw (3) holding Spring Latch (2) to Upper-Guide Housing Assembly (1) (see **Figure 7-33**).
2. Remove Spring Latch (2) from housing.
3. Replace parts as required.

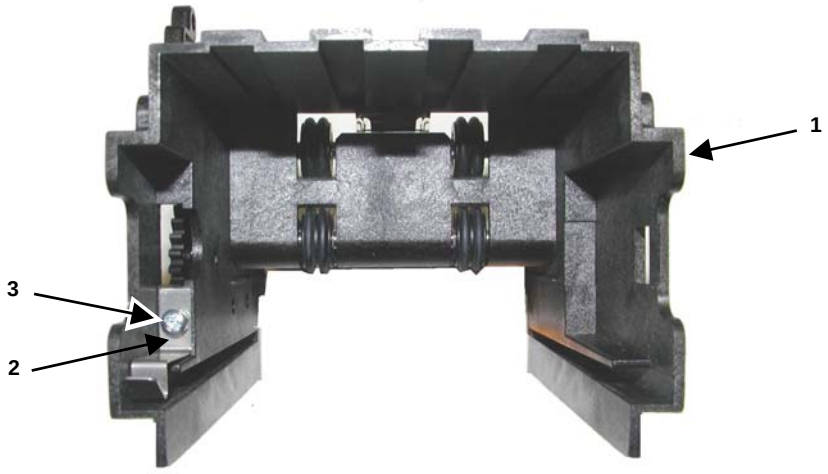


Figure 7-33. Spring Latch Parts Breakdown

Table 7-13. Latch Spring Parts List

(For parts locations, refer to **Figure 7-33**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0010-01	Assembly, Upper-Guide Housing, Model G3V (not shown)	REF
	325D0010-02	Assembly, Upper-Guide Housing, Model FL-4/FL-6	REF
2	350B0244	Latch, Spring	1
3	352-4250-0117	Screw, SEMS PPH (#4-40 x 1/4-inch), Lead Free	1

7.4.2.4 Replacement of Rear Sensor Prism and Side-Looking Sensor Optical Lenses

The Rear Sensor Prism and the two Side-Looking Sensor Optical Lenses are an integral part of the Inseparable Upper-Guide Assembly and cannot be separated from the assembly. Should these parts be damaged or have fallen off, then the Inseparable Upper-Guide Assembly must be replaced.

To replace the Inseparable Upper-Guide Assembly, follow these steps:

Note: For the following steps, numbers in parentheses correspond to the item numbers in Table 7-14.

1. Perform the instructions in **Subsections 7.4.2.1** through **7.4.2.3**.
2. Remove one screw (3) holding Side-Looking Sensor Lens Cover (2) to Upper-Guide Housing Assembly (1) (see **Figure 7-34**).
3. Replace Inseparable Upper-Guide Assembly (4).
4. Using screw (3), install Side-Looking Sensor Lens Cover (2), with smooth surface facing outward, onto new Inseparable Upper-Guide Assembly (4).
5. Perform the instructions in **Subsections 7.4.2.1** through **7.4.2.3**.

Figure 7-34. Inseparable Upper-Guide Assembly Parts Breakdown

Table 7-14. Inseparable Upper-Guide Assembly Parts List

(For parts locations, refer to **Figure 7-34**.)

ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0010-01	Assembly, Upper-Guide Housing, Model G3V (not shown)	REF
	325D0010-02	Assembly, Upper-Guide Housing, Model FL-4/FL-6	REF
2	350B0249	Side-Looking Lens Cover	1
3	350A0269	Screw, plastite	1
4	350D0202	Assembly, Inseparable Upper-Guide	1

7.4.3 Upper-Guide Optics Assembly Breakdown

This section provides the instructions to disassemble the Upper-Guide Optics Assembly. Prior to performing this procedure, the Upper-Guide Optics Assembly should be separated from the Upper-Guide Housing Assembly (refer to **Subsection 7.4.2.1**).

WARNINGS:

1. AVOID PERSONAL INJURY AND/OR SEVERE DAMAGE TO THE VALIDATOR. DISCONNECT POWER SUPPLY BEFORE CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.
2. REDUCE AND/OR PREVENT RISK OF ELECTRIC SHOCK. DO NOT CLEAN OR REPAIR VALIDATOR IN A DAMP OR WET ENVIRONMENT.
3. AVOID DANGEROUS SITUATIONS. DO NOT INTRODUCE FLAMMABLE LIQUIDS OR GASES TO THE WORK AREA WHEN CLEANING OR PERFORMING MAINTENANCE ON VALIDATOR.

CAUTION: DO NOT allow Electrostatic Discharge (ESD) to damage the validator's electronic circuits; follow all industry-accepted ESD-prevention procedures when replacing components.

The parts of the Upper-Guide Optics Assembly, which can be replaced, are:

- Upper-Guide Array Assembly (refer to **Subsection 7.4.3.1**)
- Lower-to-Upper Guide Cable Assembly (refer to **Subsection 7.4.3.2**)
- Stacker Cable Assembly (refer to **Subsection 7.4.3.3**)
- Simple Bezel Cable Assembly for G3V Units (refer to **Subsection 7.4.3.4**).
- Animated Bezel Cable Assembly for FL4/FL6 Units (refer to **Subsection 7.4.3.4**).

To replace the faulty part(s), proceed to the applicable subsection and perform the removal instructions.

7.4.3.1 Replacement of Upper-Guide Array Assembly

To replace the Upper-Guide Array Assembly, follow these steps:

1. For Model G3V:
   a. Remove Bezel Assembly as described in **Subsection 7.2.3**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.4**.
2. For Model FL-4:
   a. Remove Bezel Assembly as described in **Subsection 7.2.5**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.6**.
3. For Model FL-6:
   a. Remove Bezel Assembly as described in **Subsection 7.2.7**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.8**.

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-15.
2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

4. Remove four screws (5) that hold Upper-Guide Optics Cover (4) to Upper-Guide Optics Housing (3), and then remove cover (see **Figure 7-35**).
5. Disconnect Lower-to-Upper-Guide Cable Assembly (8) from connector J1 on Upper-Guide Array Assembly (2).
6. Disconnect Stacker Cable Assembly (9) or (10) from connector J2 on Upper-Guide Array Assembly (2).
7. Disconnect Bezel Cable Assembly (11) or (12) from connector J3 on Upper-Guide Array Assembly (2).
8. Remove three screws (5) that hold Upper-Guide Array Assembly (2) to Upper-Guide Optics Housing (3); remove Upper-Guide Array Assembly from housing; remove washer (7).

Note: When rejoining all parts, ensure nylon washer (7) is placed between the Upper-Guide Array Assembly (2) and the Upper-Guide Optics Housing (3).

9. Replace parts as required.

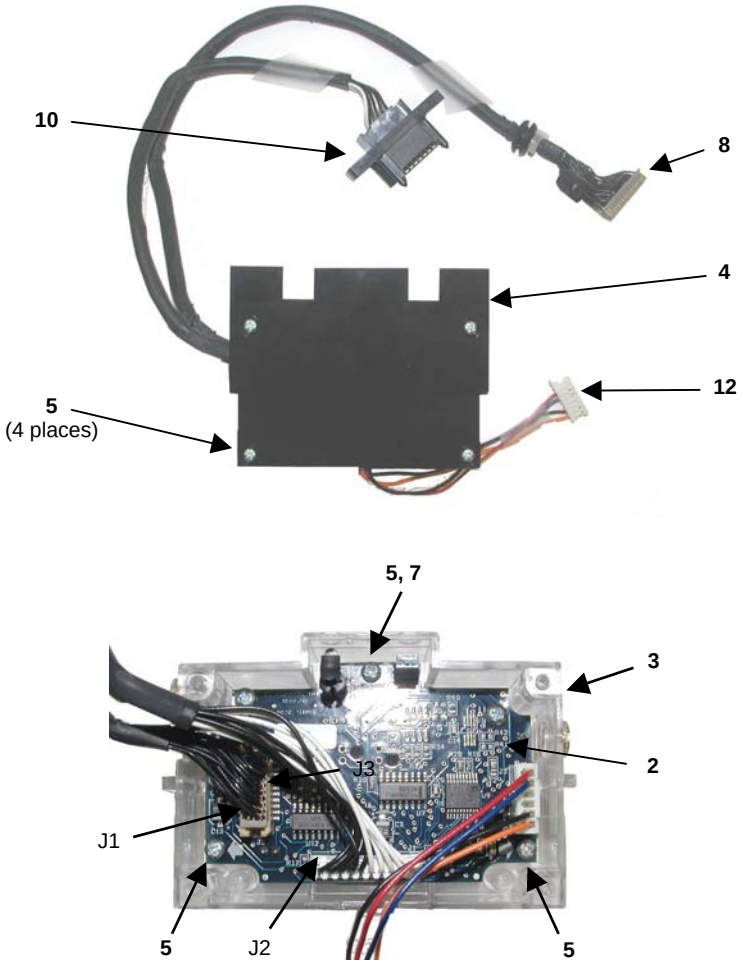
To rejoin all parts, perform **Steps 1** through **8** in reverse order.

CAUTION: DO NOT over-tighten screws (5) when installing the Upper-Guide Array Assembly – torque screws to 2.8 in-lbs; over-tightening the screws can strip the sockets and cause the assembly to become loose.

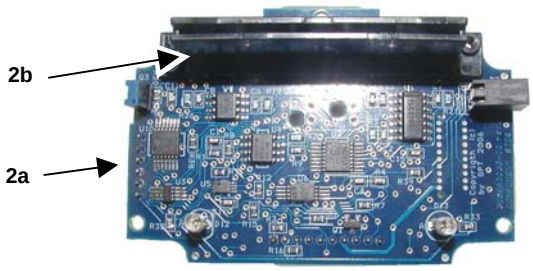
Table 7-15. Upper-Guide Optics Assembly Parts List

(For parts locations, refer to **Figure 7-35**.)

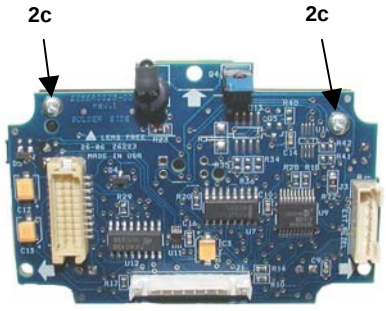
ITEM	PART NUMBER	DESCRIPTION	QTY
1	325D0004-01	Assembly, Upper-Guide Optics, Falcon	REF
2	325D0005-01	Assembly, Upper-Guide Array, Falcon; includes:	1
2a	325EA003G-01	Assembly, Transmissive Array PCB	1
2b	350D0222-01	Detector Array, Upper-Guide Optics, Lead Free (LF)	1
2c	350A0269	Screw, Phillips Pan-head, Thread-Rolling (#2 x 3/16-inch), LF	2
		Note: Torque screws to 2.8 in-lbs.	
3	350D0203-02	Housing, Upper-Guide Optics	1
4	350B0292-01	Cover, Upper-Guide Optics	1
5	300A0727	Screw, Thread Form (2.5-mm x 6-mm), LF	7
		Note: Torque screws to 2.8 in-lbs.	
6		(Item deleted.)	
7	351A0057	Washer, Nylon (0.090 x 0.187 x 0.15-inch), LF	1
8	325EC002G, or	Assembly, Cable, Lower-to-Upper Guide, Falcon; this item is used on PN 325D0003-01.	1
	325EC008G	Assembly, Cable, Lower-to-Upper Guide, Falcon; this item is used on PNs 325D0003-03 and -04.	1
9	350EC004G	Assembly, Cable, SRC with Draw Connector, Model G3V (not shown); this item is used on PN 325D0003-03.	1
10	350EC021G	Assembly, Cable, SRC with Draw Connector, Models FL-4/FL-6; this item is used on PN 325D0003-04.	1
11	325EC005G	Assembly, Cable, G3V, Simple Bezel, Model G3V (not shown); this item is used on PNs 325D0003-01 and -03.	1
12	325EC004G	Assembly, Cable, Falcon, Animated Bezel, Models FL-4/FL-6; this item is used on PN 325D0003-04.	1



Upper-Guide Optics Assembly – Cover Removed



Upper-Guide Array Assembly – Detector Array Side



Upper-Guide Array Assembly – Connector Side

Figure 7-35. Upper-Guide Optics Assembly Parts Breakdown

7.4.3.2 Replacement of Lower-to-Upper-Guide Cable Assembly

To replace the Lower-to-Upper-Guide Cable Assembly, follow these steps:

1. For Model G3V:
   a. Remove Bezel Assembly as described in **Subsection 7.2.3**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.4**.
2. For Model FL-4:
   a. Remove Bezel Assembly as described in **Subsection 7.2.5.**
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.6**.
3. For Model FL-6:
   a. Remove Bezel Assembly as described in **Subsection 7.2.7**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.8**.

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-15.
2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

4. Remove four screws (5) that hold Upper-Guide Optics Cover (4) to Upper-Guide Optics Housing (3), and then remove cover (see **Figure 7-35**).
5. Disconnect Lower-to-Upper-Guide Cable Assembly (8) from connector J1 on Upper-Guide Array Assembly (2).
6. Replace parts as required.

To rejoin all parts, perform **Steps 1** through **5** in reverse order.

7.4.3.3 Replacement of Stacker Cable Assembly

To replace the Stacker Cable Assembly, follow these steps:

1. For Model G3V:
   a. Remove Bezel Assembly as described in **Subsection 7.2.3**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.4**.
2. For Model FL-4:
   a. Remove Bezel Assembly as described in **Subsection 7.2.5**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.6**.

3. For Model FL-6:
   a. Remove Bezel Assembly as described in **Subsection 7.2.7**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.8**.

Notes:

1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-15.
2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

4. Remove four screws (5) that hold Upper-Guide Optics Cover (4) to Upper-Guide Optics Housing (3), and then remove cover (see **Figure 7-35**).
5. Disconnect Stacker Connector Cable Assembly (9) or (10) from connector J2 on Upper-Guide Array Assembly (2).
6. Replace parts as required.

To rejoin all parts, perform **Steps 1** through **5** in reverse order.

7.4.3.4 Replacement of Bezel Cable Assembly

To replace the Bezel Cable Assembly, follow these steps:

1. For Model G3V:
   a. Remove Bezel Assembly as described in **Subsection 7.2.3**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.4**.
2. For Model FL-4:
   a. Remove Bezel Assembly as described in **Subsection 7.2.5**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.6**.
3. For Model FL-6:
   a. Remove Bezel Assembly as described in **Subsection 7.2.7**.
   b. Remove Support Bracket Assembly as described in **Subsection 7.2.8**.

Notes:

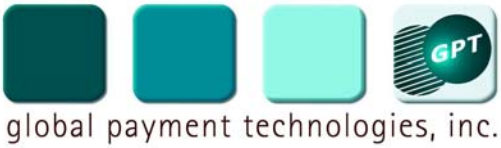
1. For the following steps, numbers in parentheses correspond to the item numbers in Table 7-15.
2. Retain hardware when breaking down the unit. Hardware can be reused, except as noted, when re-assembly is performed.

4. Remove four screws (5) that hold Upper-Guide Optics Cover (4) to Upper-Guide Optics Housing (3), and then remove cover (see **Figure 7-35**).
5. Disconnect Bezel Cable Assembly (11) or (12) from connector J3 on Upper-Guide Array Assembly (2).
6. Replace parts as required.

To rejoin all parts, perform **Steps 1** through **5** in reverse order.

This page left intentionally blank.

INDEX



A

A2 and A2A Custom Parallel, 29
A2, A2A protocol, 28
Accepting State, 35
Acronyms and Terms, xii

B

Bank Notes Accepted, 4
bezel, 48
Bezel Assembly Replacement Procedure for Model FL-4 Units, 70
Bezel Assembly Replacement Procedure for Model G3V, 64
Bezel Displays for Models FL-4 and FL-6, 42
Bezel LED Codes for Model G3V, 40
Bill Acceptance Routine, 34
Bill Rejection Routine, 35
Bill Returned event, 37
Bill Stacked event, 37

C

Calibration and Bench Testing, 51
Cash Box Assembly, 17
ccTalk protocol, 28
Changes to Document, xi
channel clearing process, 35
Cheated event, 37
Cleaning Currency Channel, 48
Communication Time-Out event, 38
Compliance, 5
Contact Information, 127
Conventions Used in This Manual, x
Corrective Maintenance, 60
CPU, xii, 32, 34, 35
currency channel, 34
Currency Channel - Cleaning Surfaces, 50
Currency Validation Processes, 32
Currency Validation Routine, 34
Currency Validator Major Assemblies, 14

D

denomination, 29, 34, 53
Description of VLA Process, 53
DIP-Switch, 29, 51
DIP-Switch Functions, 23
DIP-Switch Package, 52
disabled flag, 37
drive transport, 34

E

Environment, 4
Escrow State, 36

F

Fault condition, 36
Fault State, 36
Features, Falcon Currency Validator, 5
Front and Rear Optical Sensors, 6
Front sensors, 34
Functional Test, 49, 53
Fundamental Operation, 32

G

Glossary, xii

H

High-Level Pulse, 28
host, x, xiii, 32, 34
host machine, 34

I

ID-003 protocol, 28
Identifying Your Currency Validator, 7
Idle Spring Tension Adjustment Procedure, 97
Idle state, 32, 35
Idle State, 35
Input Power, 12-Volt, 19
Input Power, 24-Volt, 18
input voltage range, 18, 19
Intended Audience, x
Interface Connector, 6
Introduction to Falcon Currency Validator, 2

L

Lower-Guide Assembly, 14, 15, 49
Lower-Guide Assembly Breakdown, 82
Lower-Guide Housing Assembly – Disassembly Procedure, 82
Lower-Guide Optics Assembly Breakdown, 99

M

Major Assembly Cross-Reference Matrix, 60
Memory Clear Procedure, 56
, 11, 32, 34, 35
Motor Module and Stacking Mechanism Assembly, 17
Multi-Drop Bus, 27
Multi-Drop Bus protocol, xiii

N

Non-Resident Protocols, 28

O

Optics, 4, 5
Organization of This Manual, x

P

Periodic Cleaning, 48
pinout designations – Main Connector, 18
Power Consumption, 4

Power On with Bill-In-Channel Event, 38
Power Source, 4
Power Supply Assembly, 16
Power-On Reset event, 37
Power-Up Routine, 32, 33
Preventive Maintenance, 48
Program and Database Assignments, 22
Program Download Procedure, 56
Program Specification Sheets, 23
Protocols, communications, host, 27

R

rear sensor, 34
Red Status LED, 41
Reference Materials, xii
rejected bill, 35
Rejecting State, 36
Removal of Bezel Assembly for Model FL-4 Units, 76
Removal of Idler/Drive Gears and Timing Belt, 110
Removal of Support Bracket for Model FL-4 Units, 72, 78
Replacement of Bar Code Reader PCB Assembly, 105
Replacement of Bezel Cable Assembly, 121
Replacement of Front/RearPressure Rollers, 90
Replacement of Idler Wheels, Shaft-Lock Housing, and Idler Spring, 94
Replacement of Latch, 98
Replacement of Latch Spring, 114
Replacement of Lower-Guide Optics Assembly, 83
Replacement of Lower-to-Upper-Guide Cable Assembly, 120
Replacement of Main Assembly PCB, 99
Replacement of Rear Sensor Lens or Side-Looking Sensor Optical Lenses, 115
Replacement of Regulator Assembly, 104
Replacement of Stacker Cable Assembly, 120
Replacement of Stepper Motor Assembly and Motor Bracket, 88
Replacement of Upper-Guide Array Assembly, 117
Replacement of Upper-Guide Optics Assembly, 107
Resident Protocols, 27
Returning State, 36
Rollers, 49
RS-232, 32
RS-232 Interface, 4
RS-232 V2.2 Standard/Extended protocol, 27

S

Sensor Suite, 5
Service Acceptance Test, 49, 53
Set Stacker Optional for Operation Mode command, 37
Shipping Weight, 5
Single-Head Configuration, 6
Specifications, Falcon Currency Validator, 4
Stacker, xiii, 11
Stacker Maintenance, 56
Stacker/Deflector Plate Replacement Procedure for Model G3V Units, 62
Stackers, 11, 17
Stacking State, 35
Stepper Motor Assembly, 16
Stringing Detection, 6
Supplemental Service Procedures, 56
Support Bracket Replacement Procedure for Model G3V, 66

T

transport, 35
Troubleshooting, 44

U

Upper-Guide Assembly, 14
Upper-Guide Assembly Breakdown, 106
Upper-Guide Optics Assembly Breakdown, 116

V

Validator events, xiii, 37
Validator states, xiii, 35
Validator States and Events, 35
VFM/GL5 protocol, 28, 29
Video-Level Adjustment, 49, 51
Video-Level Adjustment Card, 51

W

Warnings, Cautions, and Notes, xi

This page left intentionally blank.

CONTACT INFORMATION

Global Payment Technologies, Inc.
170 Wilbur Place
Suite 600
Bohemia, New York, USA 11716
Tel: (631) 563-2500
Fax: (631) 563-2630
http://www.gpt.com/

GPT E-Mail Addresses:

Sales Information ..... **sales@gptx.com**
Customer Service ..... **customerservice@gptx.com**

Other GPT Locations:

Global Payment Technologies, Ltd., Europe & Middle East
29 Park Royal Metro Centre
Britannia Way, London NW10 7PA
England
Tel : (011) 44-20-8961-6116
Fax : (011) 44-20-8961-6117

Global Payment Technologies Holdings (Proprietary) Ltd., Africa
8 Saturn Cres
Lindro Business Park, Gauteng 2196
Africa
Tel : (011) 27-011-997-6600
Fax : (011) 27-011-608-0454

Global Payment Technologies, Pty. Ltd., Australia
13-15 Lyon Park Road
Macquarie Park, N.S.W. 2113
Australia
Tel : (011) 61-2-9887-8600
Fax : (011) 61-2-9887-8601

Global Payment Technologies, Russia & CIS
Russia, 127030 Moscow
Sushchevskaya 21, Office 31
Tel/Fax: +7-095-973-5760
Tel: +7-095-973-5761

Global Payment Technologies, Pty. Ltd., South America
Dennys Noriega
Calle Quito 191 – Of. – 201
Santa Patricia – La Molina
Lima, Peru
Tel: +511-9-791-5551
Tel/Fax: +511-348-6998

This page left intentionally blank.

ADDENDUM – TECHNICAL BULLETINS

This Addendum Last Updated 15 January 2007

and Covers:

1. INTRODUCTION
2.
3.
4.
5.
6.

Introduction

This Addendum to our technical manual was created as a place to store relevant *GPT* technical bulletins for your Currency Validator. *GPT* is committed to providing high-quality technical service and support to meet your business needs. As part of that support, our Documentation Department periodically publishes technical bulletins that cover a variety of technical matters as a supplement to our manuals. Further, our technical bulletins are a means to provide information quickly to our customers before revisions of technical manuals are released. So, customers are encouraged to scan our Web site's technical section for product information updates at: http://www.gpt.com/

Also, our Support Engineers will gladly respond to questions regarding the use and function of *GPT* products and will help to answer software, hardware, and general application issues. We encourage your recommendations for future *GPT* product enhancements. Please contact our Customer Service Department at: customerservice@gptx.com

Although information contained in the technical bulletins found in this addendum has already been incorporated into this manual, it is presented here for illustrative purposes. As additional technical bulletins are published onto *GPT's* Web site, technicians are encouraged to print them out and place them into this addendum. In this way, technicians will always have the latest technical information readily available.

Since *GPT* publishes its bulletins using serial publication numbers across product lines, bulletin numbers do not follow in strict ascending numerical order for a particular product.